VOL. XXXVII No. 8 AUGUST 1952

MECCANO MAGAZINE

ELECTRIC ARC FURNACE

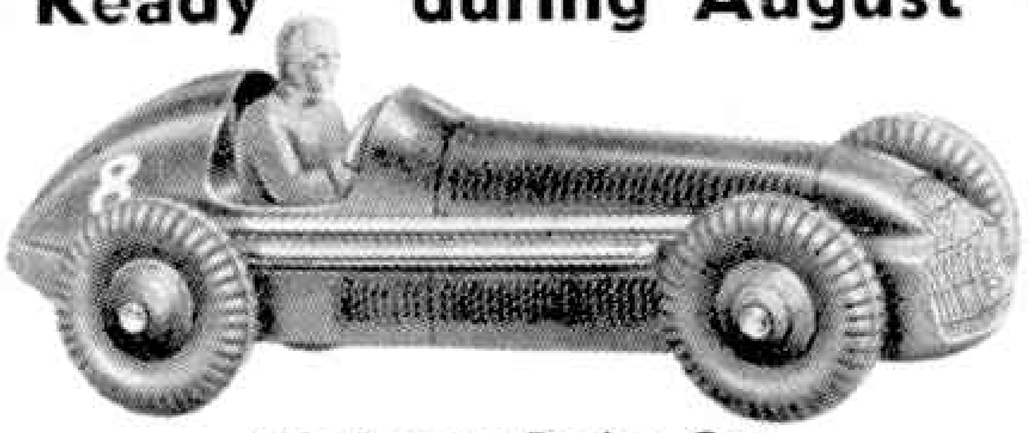
9D.

DINKY TOYS

TRADE MARK REGD.

NEW

Ready during August



Alfa Romeo Racing Car
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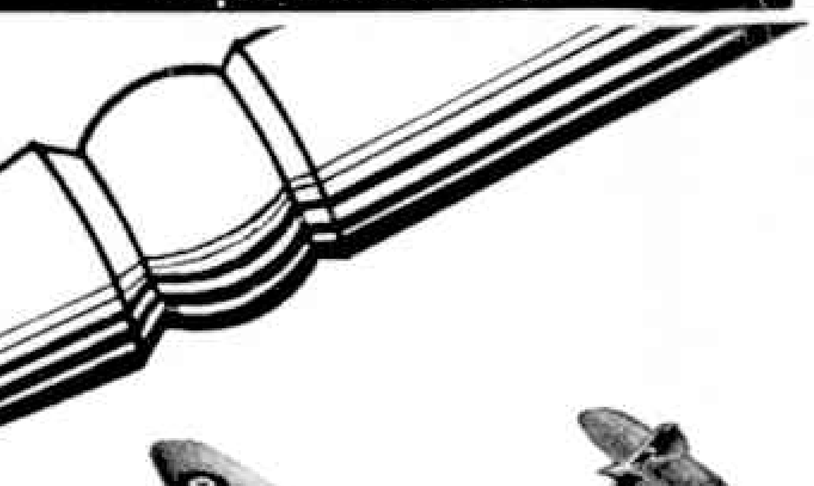
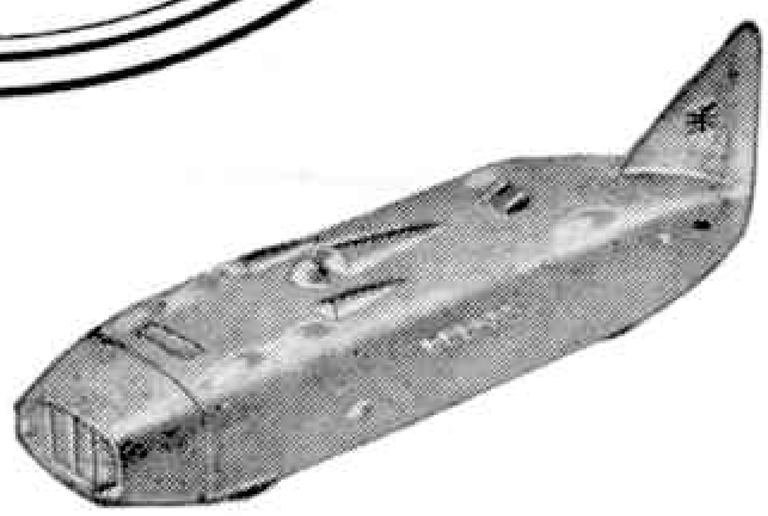


Meteor Twin Jet Fighter
No. 70e
11d.

"Viking" Air Liner
No. 70c
2/2

Universal Jeep
No. 25y
4/4

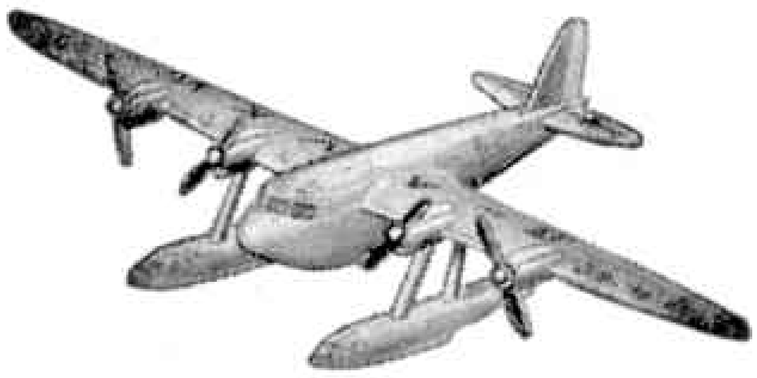


Streamlined Racing Car
No. 23s
2/9

Tempest II Fighter
No. 70b
10d.

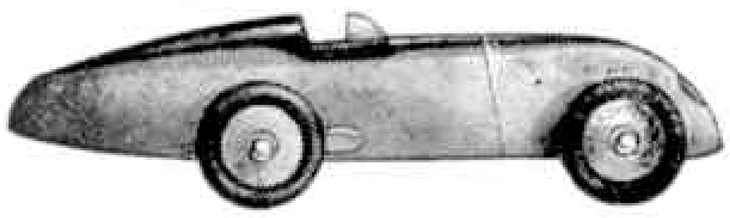
Estate Car
No. 27f
3/5

"Speed of the Wind"
Record Car
No. 23e
2/5



Seaplane
No. 63b
1/10

Twin-Engine Fighter
No. 70d
9d.



Small Open Racing Car
No. 23a
1/11

Avro "York" Air Liner
No. 70a
3/9

Prices include Purchase Tax

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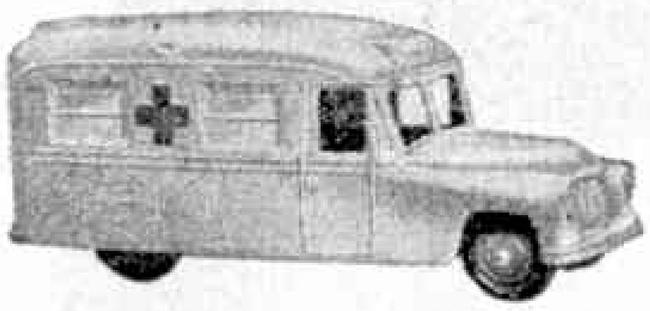
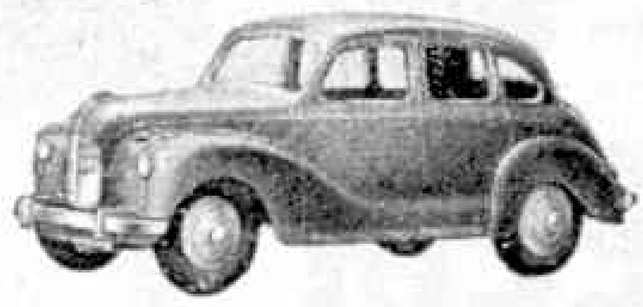
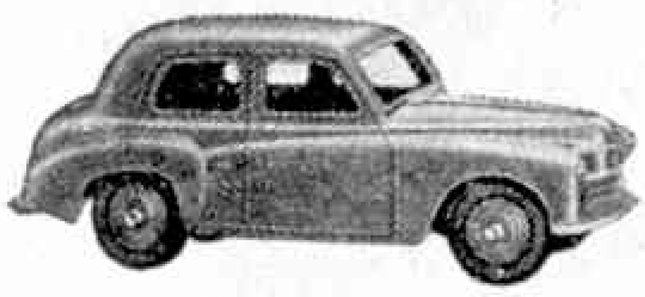


Daimler Ambulance
No. 30h
3/5

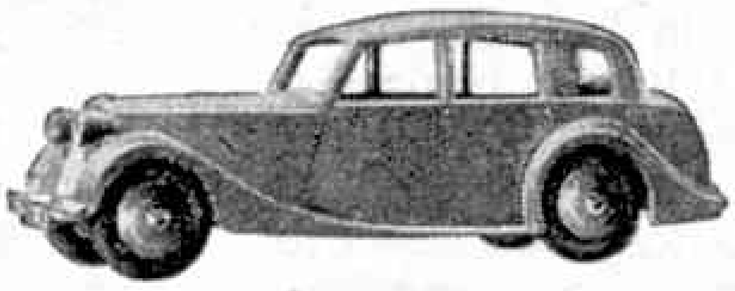


Austin "Devon" Saloon
No. 40d
2/11

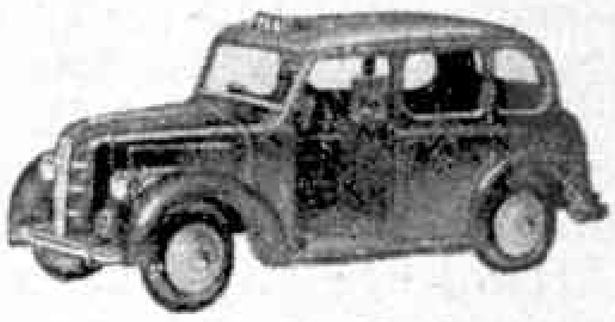
Ford "Fordor" Saloon
No. 139a
3/1



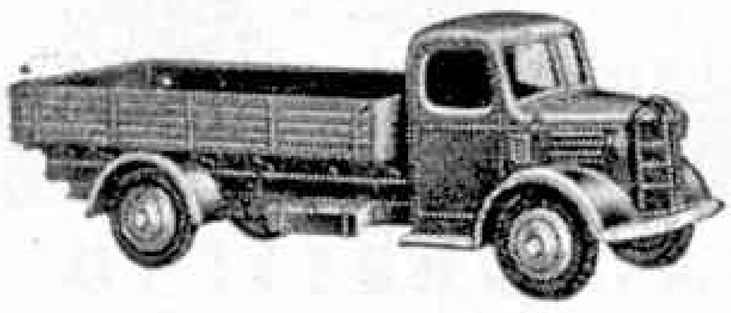
Hillman Minx Saloon
No. 40f
2/11



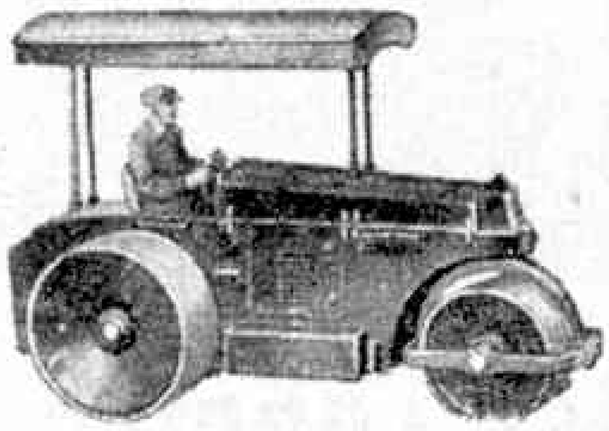
Triumph '1800' Saloon
No. 40b
2/11



Austin Taxi
No. 40h
3/10

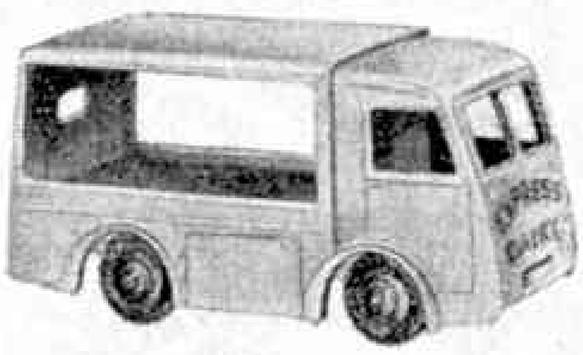


Austin Wagon
No. 30j
2/11



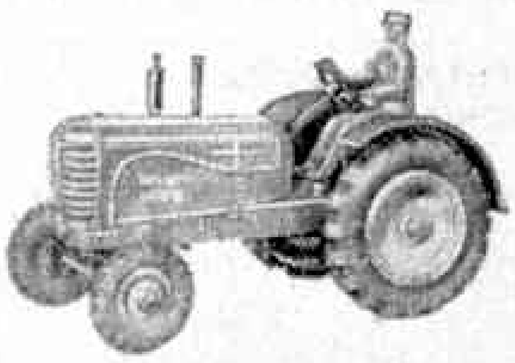
Aveling-Barford Diesel Roller
No. 25p
4/4

Coventry Climax Fork
Lift Truck No. 14c
8/1

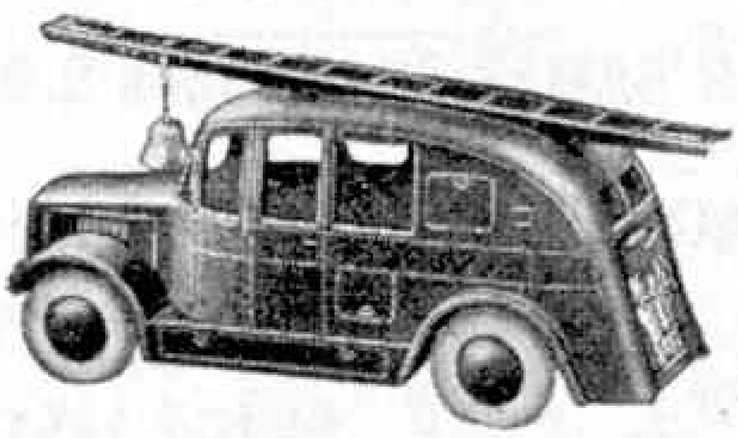


Electric Dairy Van
No. 30v
4/-

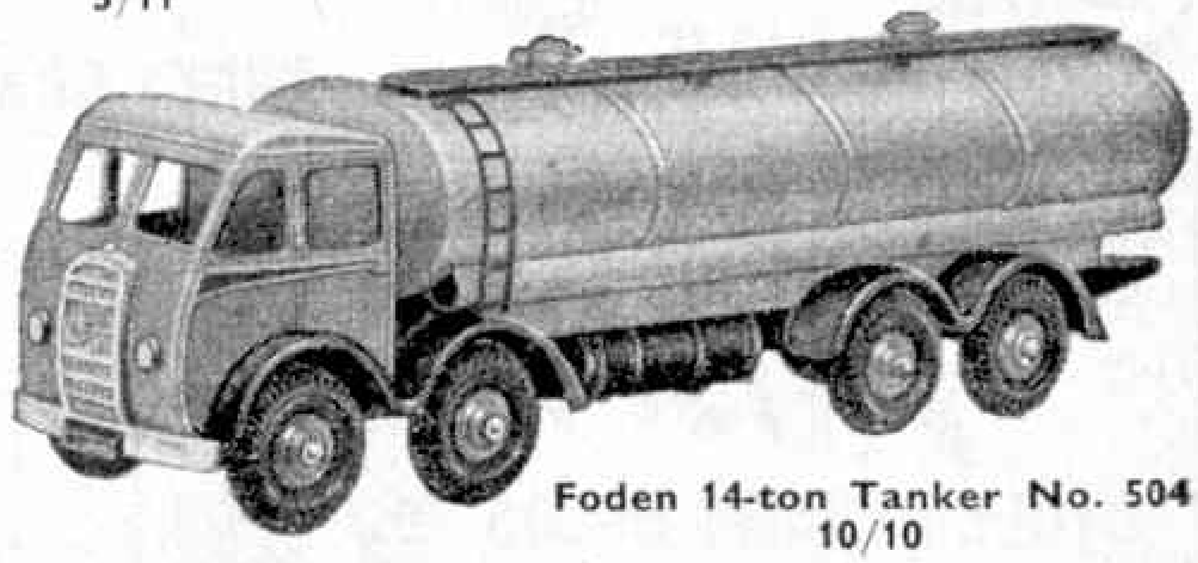
Bedford End Tipper
No. 25m
5/11



Massey-Harris Tractor
No. 27a
4/8



Streamlined Fire Engine
No. 25h
2/11



Foden 14-ton Tanker No. 504
10/10

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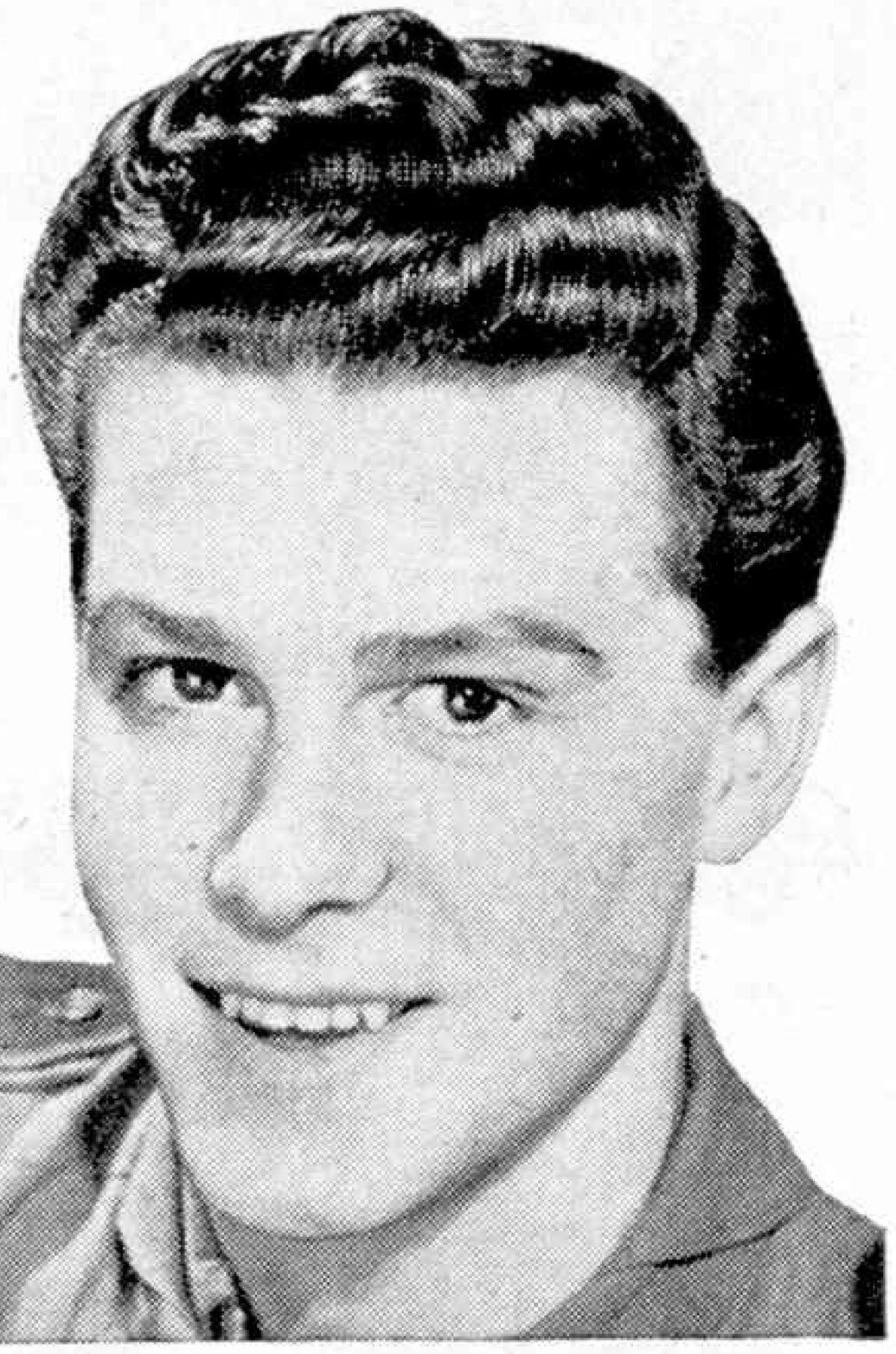

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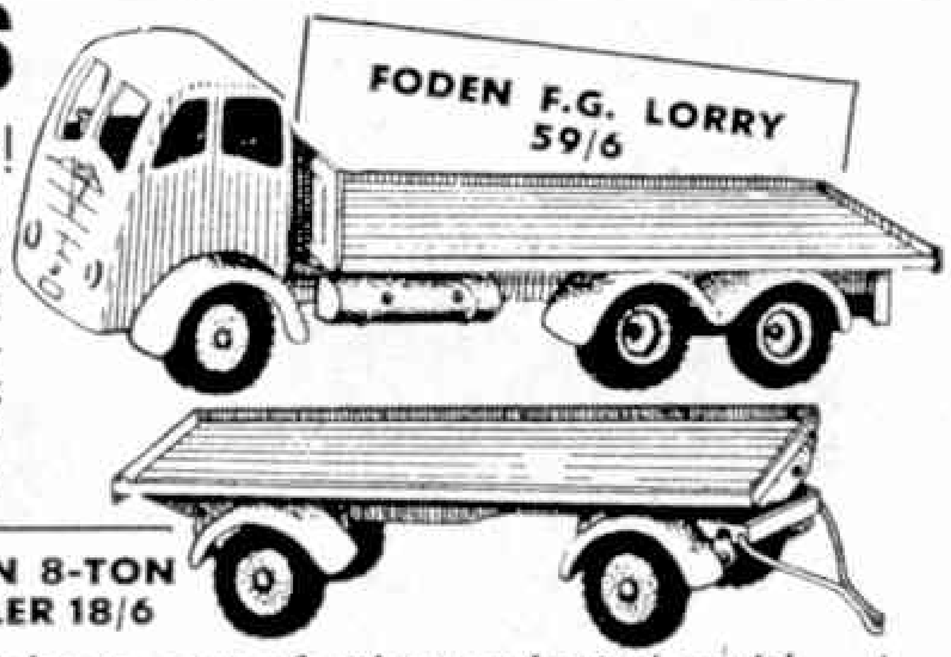

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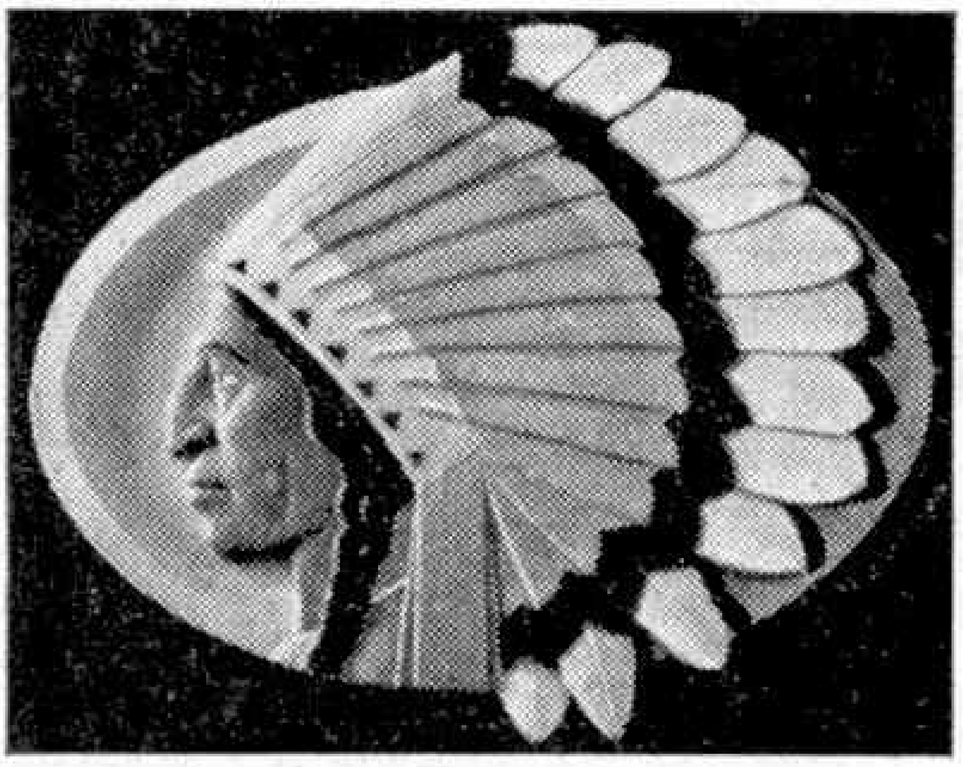

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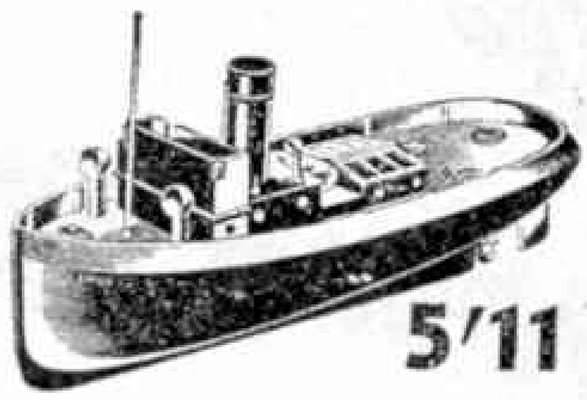

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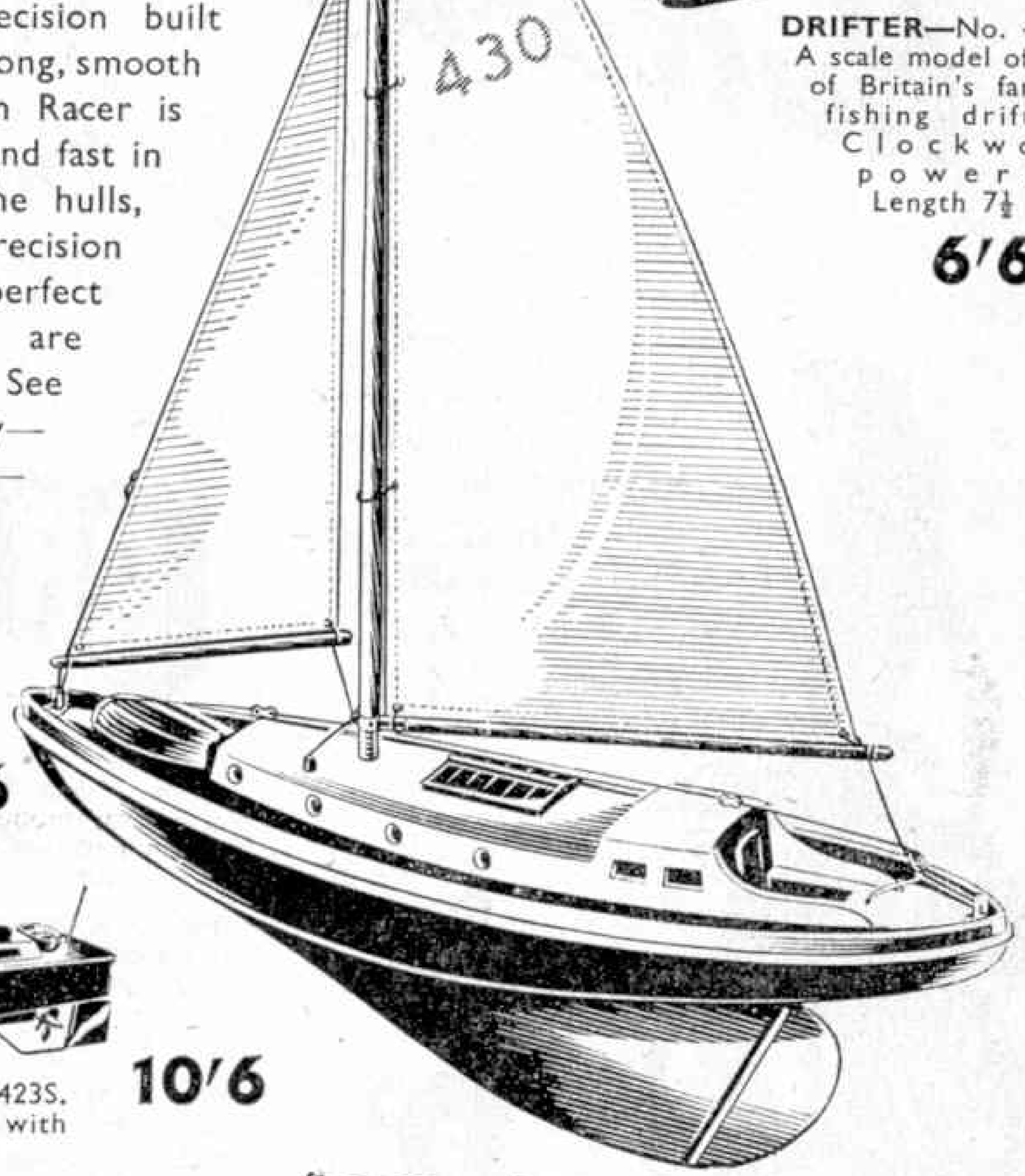

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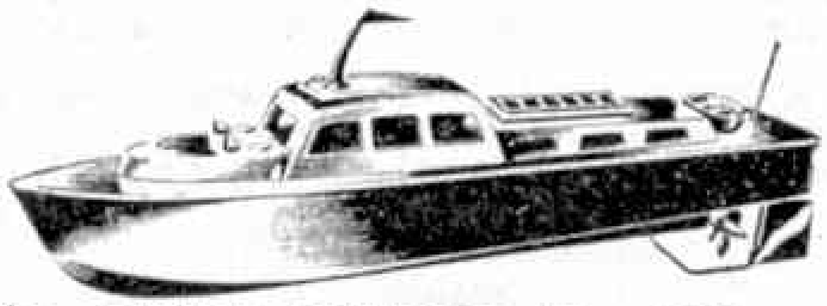

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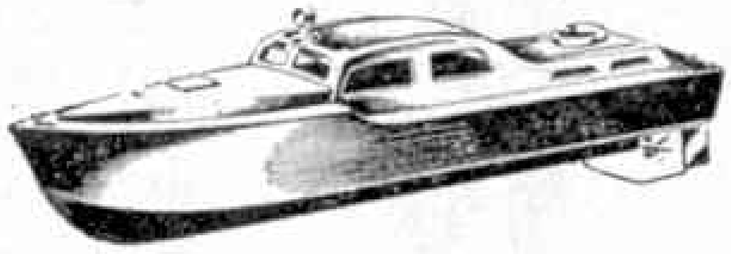

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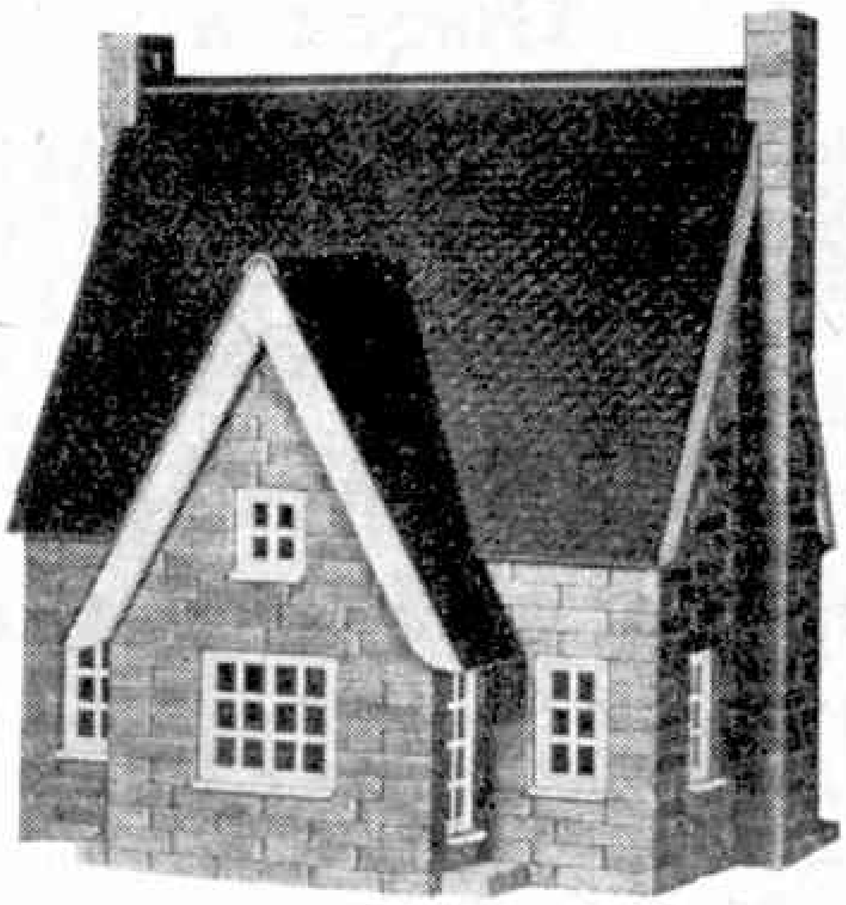

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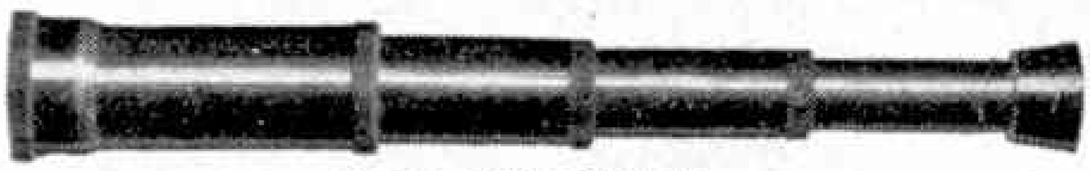

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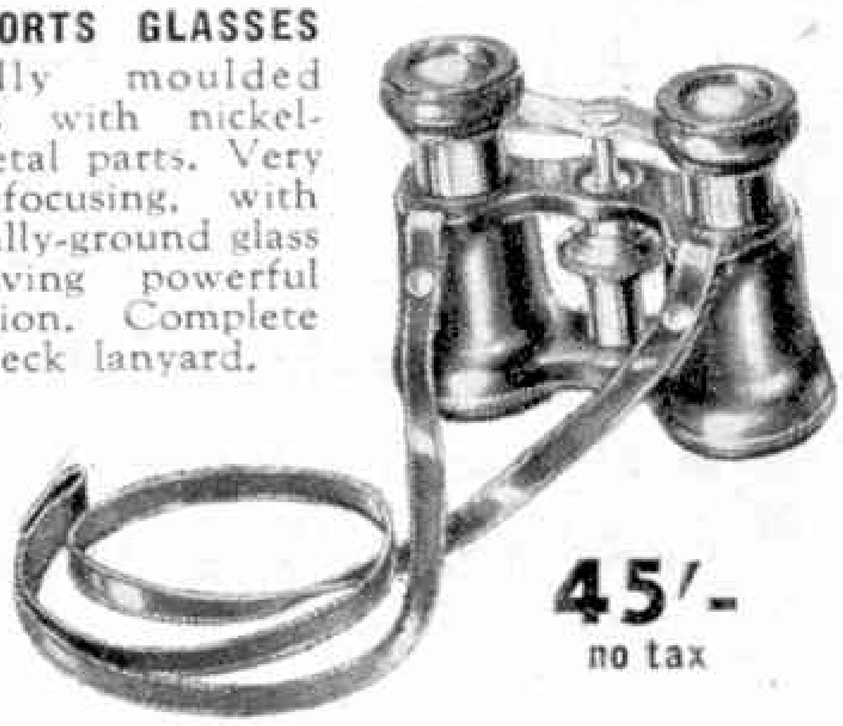

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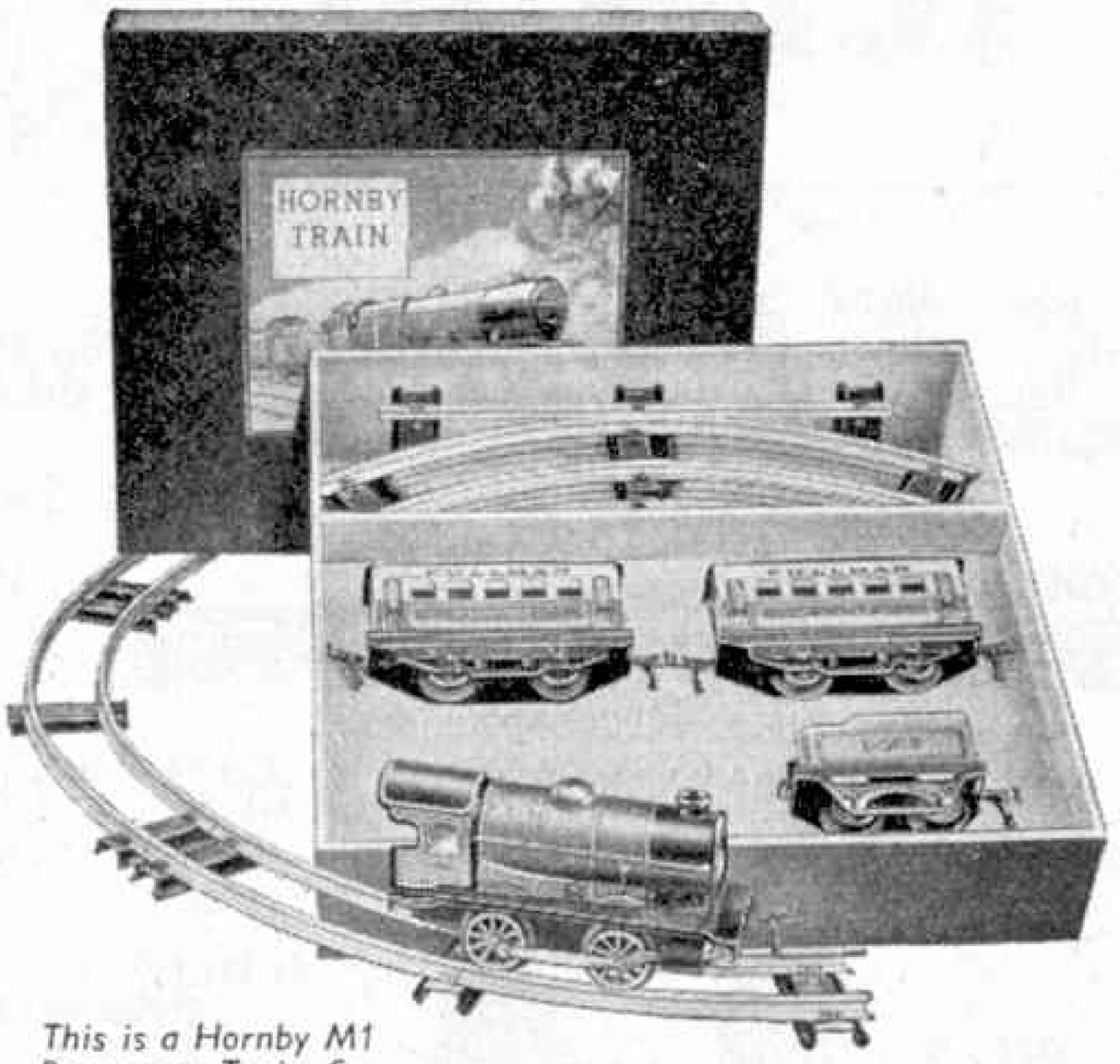

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Next Month: "NATURE'S SPEED RECORDS." By D. Gunston

MECCANO MAGAZINE

Editorial Office:
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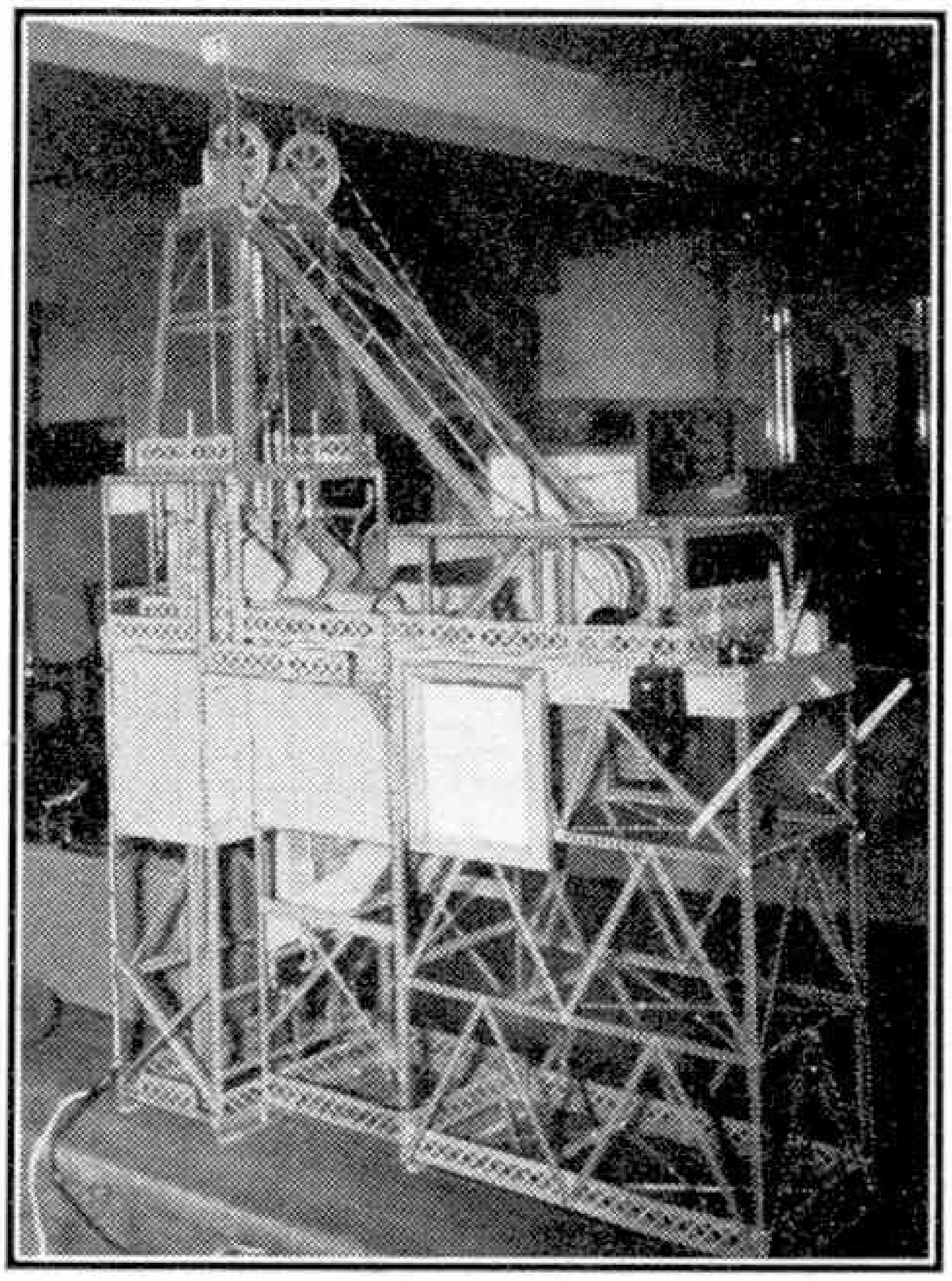
Vol. XXXVII
No. 8
August 1952

About Ourselves

This month I want to talk to you about the Magazine. For well over 30 years it has provided its many thousands of readers, old and young, with information on a vast range of different topics of real interest to them. I say old and young, because the boy who buys a copy of the *"M.M."* is not its only reader. His entire family looks forward eagerly to the coming of each month's issue, and from time to time I hear of cases in which the enthusiast who brings it into his home has little chance of reading it until his elders have had a go themselves!

How many actual readers of the *"M.M."* there are therefore I do not know, but I do know that all of them deserve something even better, and I have made plans to improve the Magazine for them. To begin with, paper of better quality will be used in its production from next month onward. This will be whiter and will have a better surface, so that the Magazine will be easier to read and, most important of all, the pictures will be brighter and clearer.

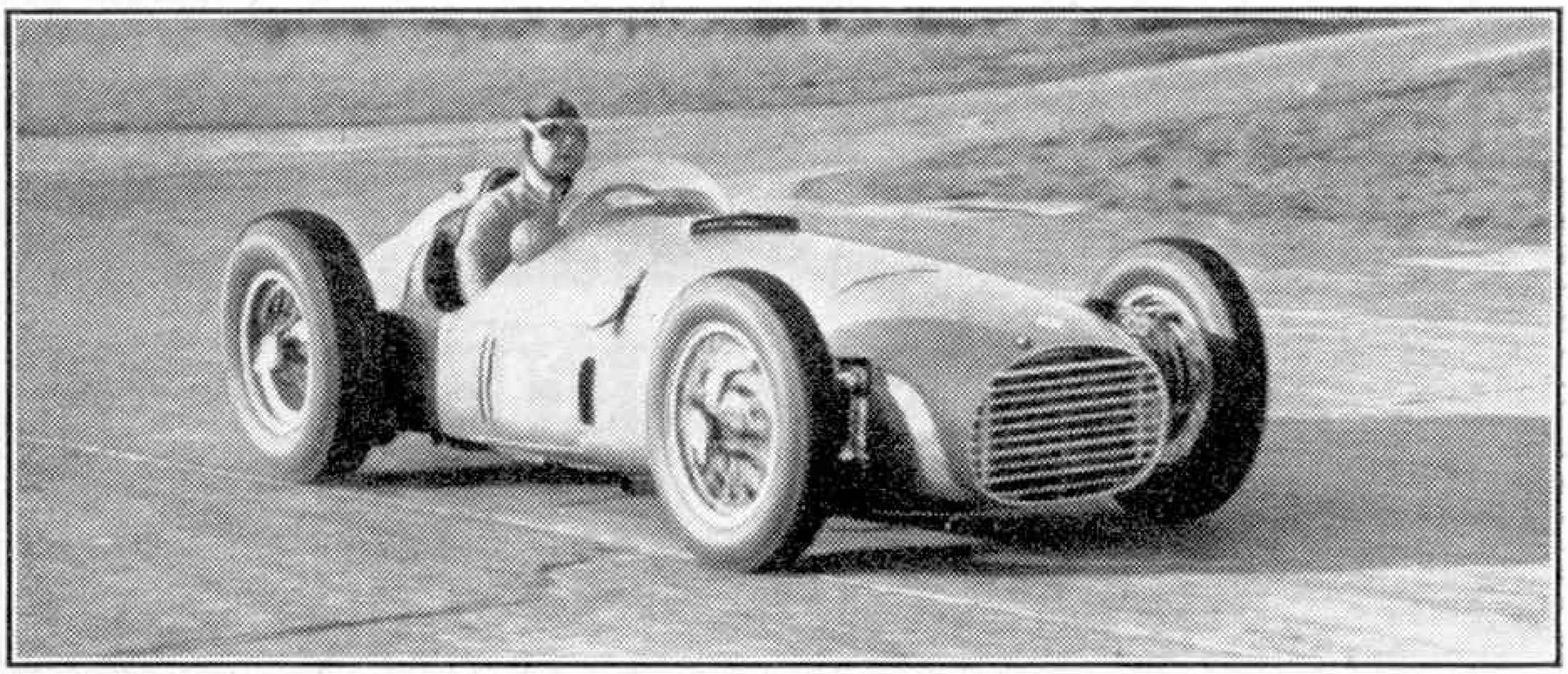


This fine working Meccano model of the Thoresby Colliery Skip Winding Plant was constructed for the East Midlands Division of the National Coal Board. It was built for an Exhibition in Nottingham and later was shown in other places in the coalfields. Its realistic working aroused very great interest throughout its tour.

Further cheering news is that the number of pages in the Magazine will be increased. At the moment I cannot make any definite promise about the additions to be made, but the October and November issues will certainly be thicker. The December issue too will be specially enlarged. It will indeed be reminiscent of the days before the war, when the coming of the special Christmas number of the *"M.M."* was a great event wherever there were Meccano and Hornby Trains enthusiasts—and that meant all over the world, as it means today!

These changes will be steps on the way to a larger and brighter *"M.M.,"* which will be more attractive than ever and far more useful to its readers.

The Editor



Britain's Grand Prix Challenger

An Outline of the B.R.M. Design

By Raymond Mays

CARS taking part in the World's great motor races have to conform to a formula laid down by the Federation Internationale d'Automobile. The formula now in force, and due to remain until the end of next year, stipulates that cars shall have engines measuring not more than 1,500 c.c. if fitted with superchargers, and not more than 4,500 c.c. if unsupercharged. A supercharger—in other words a pump to force the air fuel mixture into the cylinders—has an effect equivalent to an additional "ration" of capacity, or swept cylinder volume.

As it is possible, in both theory and practice, to conjure more power from a highly supercharged 1½-litre (1,500 c.c. engine with a large number of cylinders than from an "unblown" one of 4½-litres (4,500 c.c.), the B.R.M. designers, headed by my friend Peter Berthon, have pinned their faith on the former layout. In doing so, however, as they realised from the start, they have undertaken a truly pioneering task, for no other engine in the world has been set so high a target in revolutions per minute and power output in relation to swept volume.

These explorations of hitherto unknown r.p.m. and b.h.p. regions bring many baffling problems in their train, which would have been avoided if our technicians had been content to tread familiar ground and draw on established text book data.

First, let me outline briefly the design of the B.R.M.'s engine. This unit has no less than sixteen cylinders, each so small—about the size of the tiniest motorcycle's two-stroke engine—that a complete piston and connecting rod can comfortably be grasped in the palm of one hand. The main engine casting, made in a special light alloy known as RR50, consists of the upper half of the crankcase and the two cylinder blocks. These blocks, each containing eight cylinders, form a "V," with the very wide included angle of 135 degrees. The pistons run in what are known as wet liners, that is, subsidiary internal cylinders which are in direct contact with the cooling water.

The crankshaft is made up in two parts, rather as though the engine consisted of two separate V-eights in tandem, and joined centrally. On this central portion, two spur gears are mounted, and, from them, drives are taken for the power take-off shaft itself—which runs below the lower crankcase half and rotates at about half the speed of the crankshaft—

The 1952 B.R.M. on test at Folkingham, Lincolnshire. At the wheel is Raymond Mays, the famous British racing motorist who has written this article about the car specially for "M.M." readers. Mr. Mays has many racing successes to his credit. He was associated with the production of the E.R.A., which he drove in many victories, and has been the force behind Britain's present Grand Prix challenger, the B.R.M., which is probably the fastest Formula I racing car ever built.

and for the camshafts and the engine auxiliaries.

There are four separate cylinder heads, one to each group of four cylinders, the heads being RR53 aluminium alloy castings. The overhead valves—two per cylinder—are inclined to each other at the exceptionally wide angle of 87½ degrees, and there are four camshafts—two to each bank of cylinders. As the exhaust valves are subjected to greater heat than the inlets, they are given hollow stems and filled with sodium. Unlike the crankshaft, which has ten plain bearings, the camshafts run in roller bearings. The valves seat on inserts made from an intensely tough material called NMC.

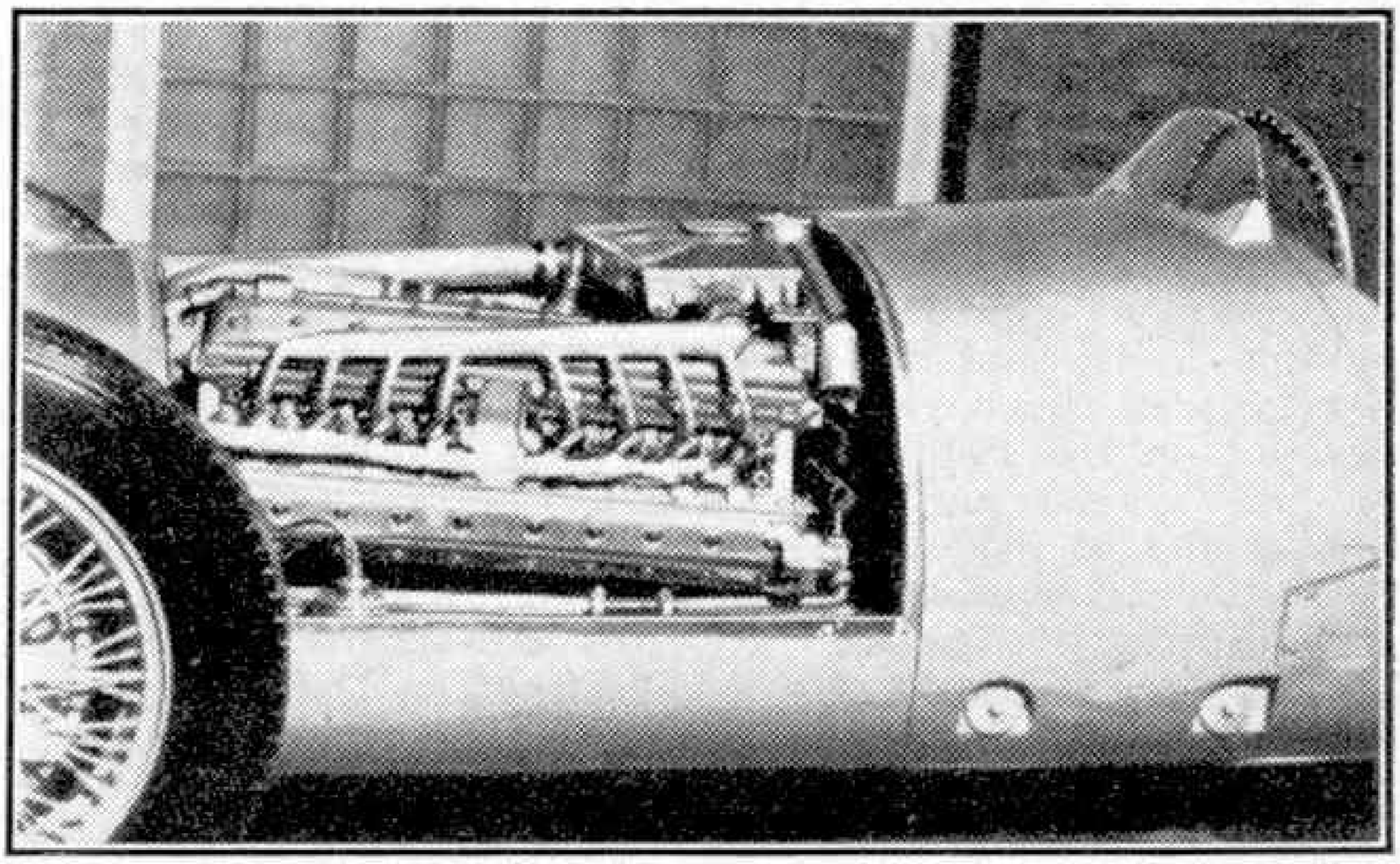
Among their several other functions, the central spur wheels mentioned above drive the centrifugal two-stage supercharger, which has been specially developed for the B.R.M. by Rolls-Royce, who have unequalled experience in this field, thanks to their aircraft work. This "blower" is mounted at the extreme front of the engine, and draws mixture from a huge twin-choke S.U. carburetter. There is provision for varying the rate at which the supercharger runs, relative to the crankshaft; in the final stages of the B.R.M.'s development it may well be that supercharger speeds of well over 50,000 revolutions per minute will be reached.

The clutch, by Borg and Beck, is a dry multi-plate type, built in unit with the engine; astonishingly compact and light, its diameter is only 7½ in. and its weight 30 lb.

Ignition is by four separate coils, which draw their current from a small battery carried at the rear of the chassis. There are two oil pumps (delivery and scavenge), both driven from the central spur gears, and these pumps circulate lubricant at the rate of 20 gallons per minute. The main oil tank is situated alongside the engine, on its left hand side. The B.R.M.'s special alcohol fuel—the stuff they sometimes call "liquid dynamite"—has two tanks to itself, one behind the driver, in the tapered tail (15 gallons capacity) and another in the shape of an inverted "U" and mounted above the pilot's knees (25 gallons).

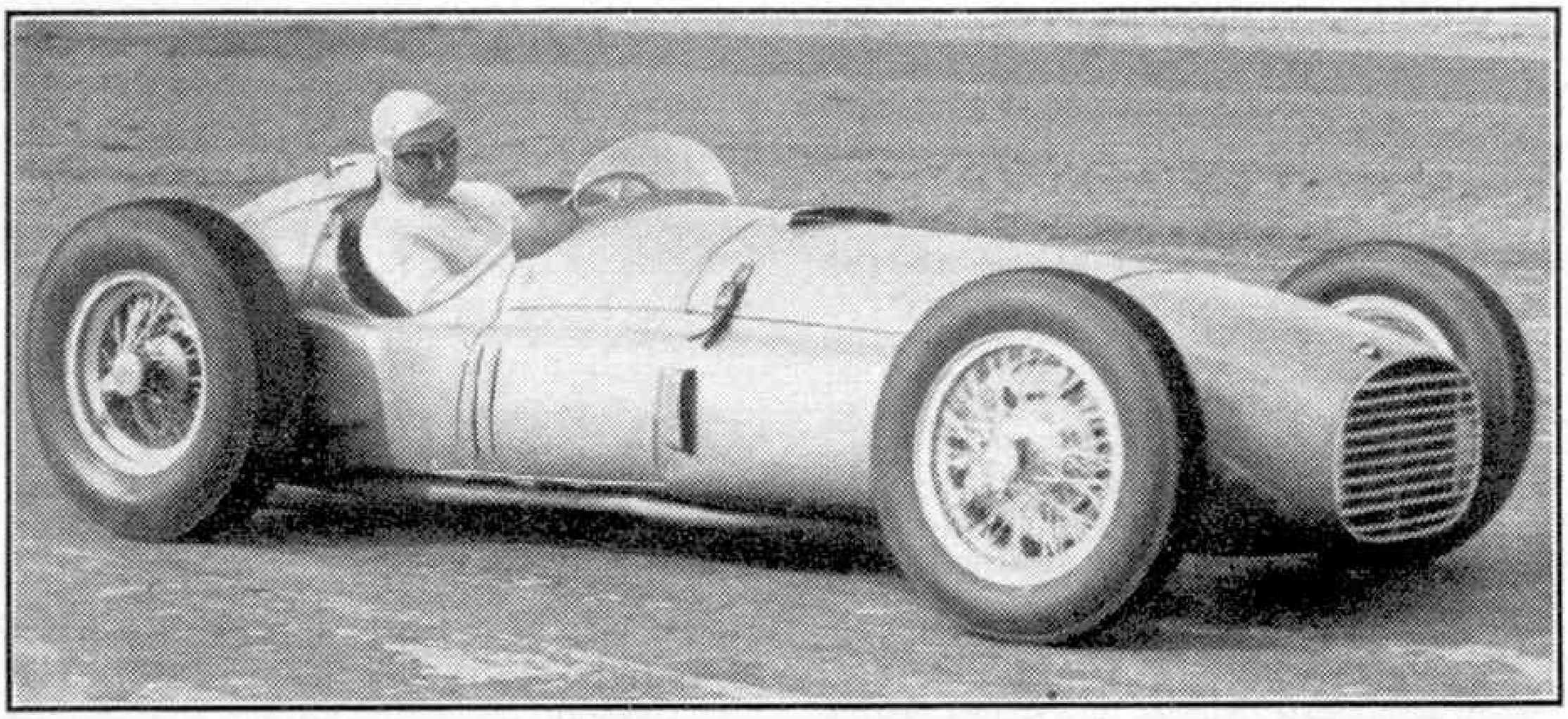
Although of no larger capacity than that fitted to an average 14 h.p. family car, the B.R.M. engine in its present form develops well over 400 h.p., its crankshaft rotating at about 12,000 revolutions per minute in the process. Later, if all goes well, when still higher supercharger boosts can be exploited (the current boost figure runs at around 40 pounds per square inch) it is possible that outputs of 600 horse power will be reached. If so, this will be almost the highest power ever delivered by a road racing engine, in spite of the fact that the formula governing Grand Prix machines back in the 'Thirties permitted *any* capacity to be used, and the German projectiles of the day did in fact reach and exceed six litres, or four times the B.R.M.'s figure.

In designing the chassis frame for the B.R.M., our experts at Bourne had to reconcile the conflicting ideals of lightness and immense strength. This was done by making up the two main side members from pairs of parallel tubes, one above the other, and uniting them with long plates pierced for lightness with a series of large holes. Diameter of the tubes is 2½ in., and the material chrome-molybdenum steel. Of the three cross members which tie these main girders together, one is of similar construction to the longerons while the other two are simple tubes.



The powerhouse of the B.R.M., a 1,500 c.c. 16-cylinder supercharged engine that in its present form develops over 400 h.p., at a crankshaft speed of 12,000 r.p.m.

The front wheels are independently suspended on trailing links, giving a vertical rise and fall and thereby avoiding



World Champion Juan Fangio drives the 1952 B.R.M. in practice. This famous driver from the Argentine was the outstanding figure in Grand Prix racing events of 1951

gyroscopic disturbances at high speeds. In place of ordinary springs or torsion bars, the B.R.M. uses pneumatic struts of Girling manufacture—these struts, which take the form of small cylinders and are rather similar in appearance to telescopic shock-absorbers, have many advantages, among which are their extreme compactness and minimisation of unsprung weight. Many authorities consider that the day is not far off when pneumatic suspension systems will oust ordinary springs entirely. If such proves right, this will be but one of many respects in which B.R.M. experimenters and pioneer work have aided the progress of the every-day car.

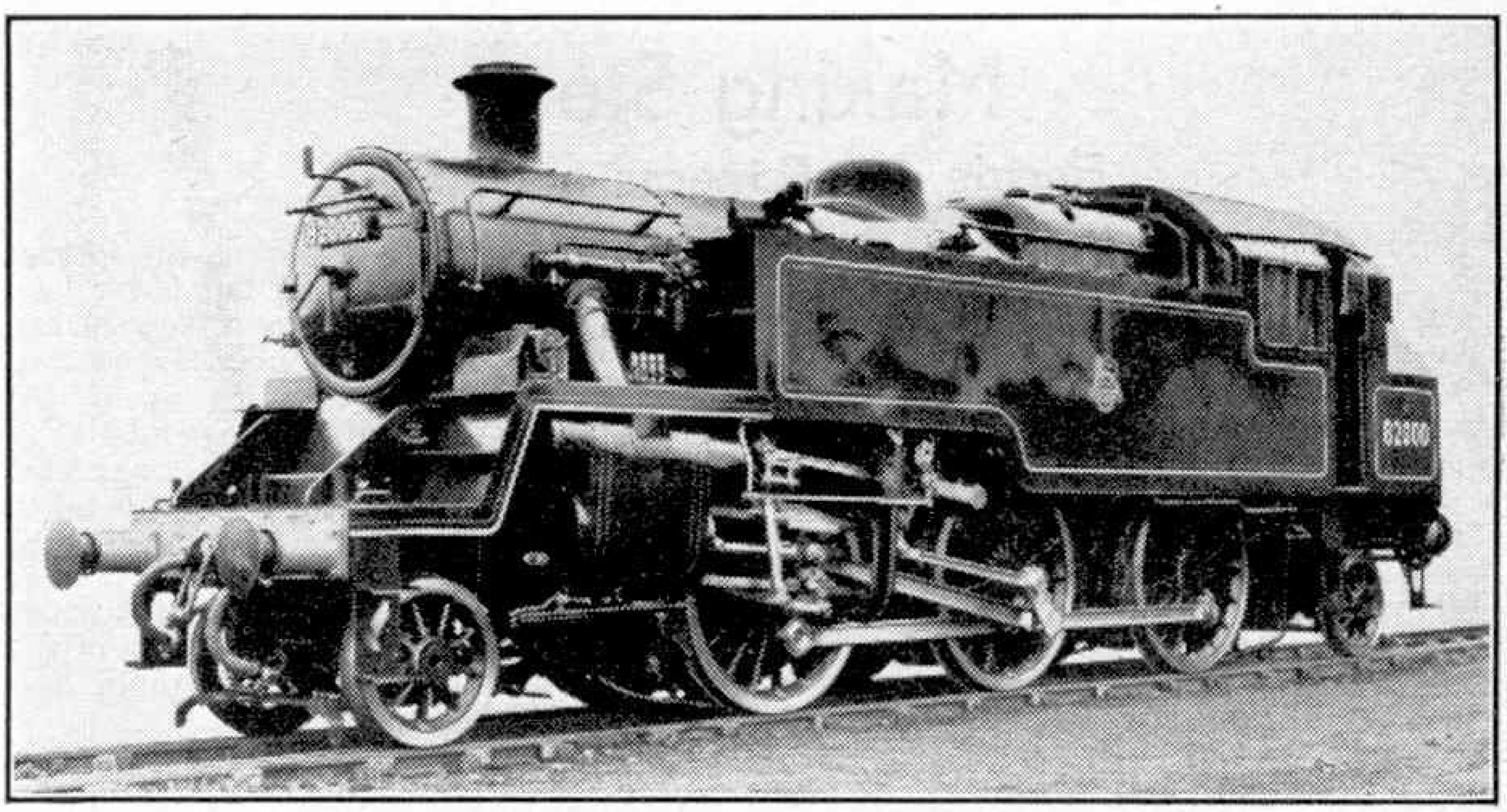
At the rear, the B.R.M. employs what is known as the De Dion suspension system, a development of a very early German idea, which is now almost universal practice on the fastest Grand Prix cars. In this system, unsprung weight, that arch-enemy of road adhesion, is reduced to the limit by mounting the final drive and differential housing (in this case combined with the five-speed gearbox) fast on the chassis, instead of allowing it to rise and fall with the wheel deflections.

The differential itself is of the limited-slip type (ZF), and on each side of it is a universal joint mating with the inner end of a short axle half-shaft. Similar universals are incorporated at the outer ends of these half-shafts, and triangulated radius arms run forward from the hub assemblies to pivot lugs on the main chassis longerons. To deprive the road wheels of independent motion, which experience has proved to be unsatisfactory on high speed road cars, a large diameter axle beam, flanged at its ends, is used to unite the two wheels. Making due allowance for the torsional effect created in this axle tube when one wheel strikes a bump which the other one misses, the tube is sleeved for articulation at its centre point.

Like all cars of Grand Prix calibre, the B.R.M. has different sized wheels and tyres, front and back, the rear wheels being of 17 in. diameter with 7.00 in. tyres, while the corresponding front dimensions are 18 and 5.25 in. Very wide and robust rear treads are necessary to enable the enormous torque to be transmitted to the road with the minimum of wheelspin. The fronts, with no power to deliver, are kept relatively small and light to relieve unsprung weight.

On cars with a maximum speed approaching the 200 m.p.h. mark, brakes are naturally all-important, and here again B.R.M. adopts a pioneer role. Our latest brakes are of disc type, entirely unlike anything so far used in Europe on production vehicles, and products of the ever enterprising Girling organisation. Their efficiency is such that when Juan Manuel Fangio, the reigning World's Champion of motor racing, first tried them on the B.R.M. he declared that they called for a complete revision of his previous standards of retardation.

Minor mechanical troubles caused bitter disappointment in France and Ireland, but we hope to retrieve the position in the Formula Libre races later this season. Thus we hope, even though belatedly, to vindicate the faith placed in this far-sighted project by generous firms, not to mention thousands of individual enthusiasts of the B.R.M. Association. The battle is on, and we are ready for it.

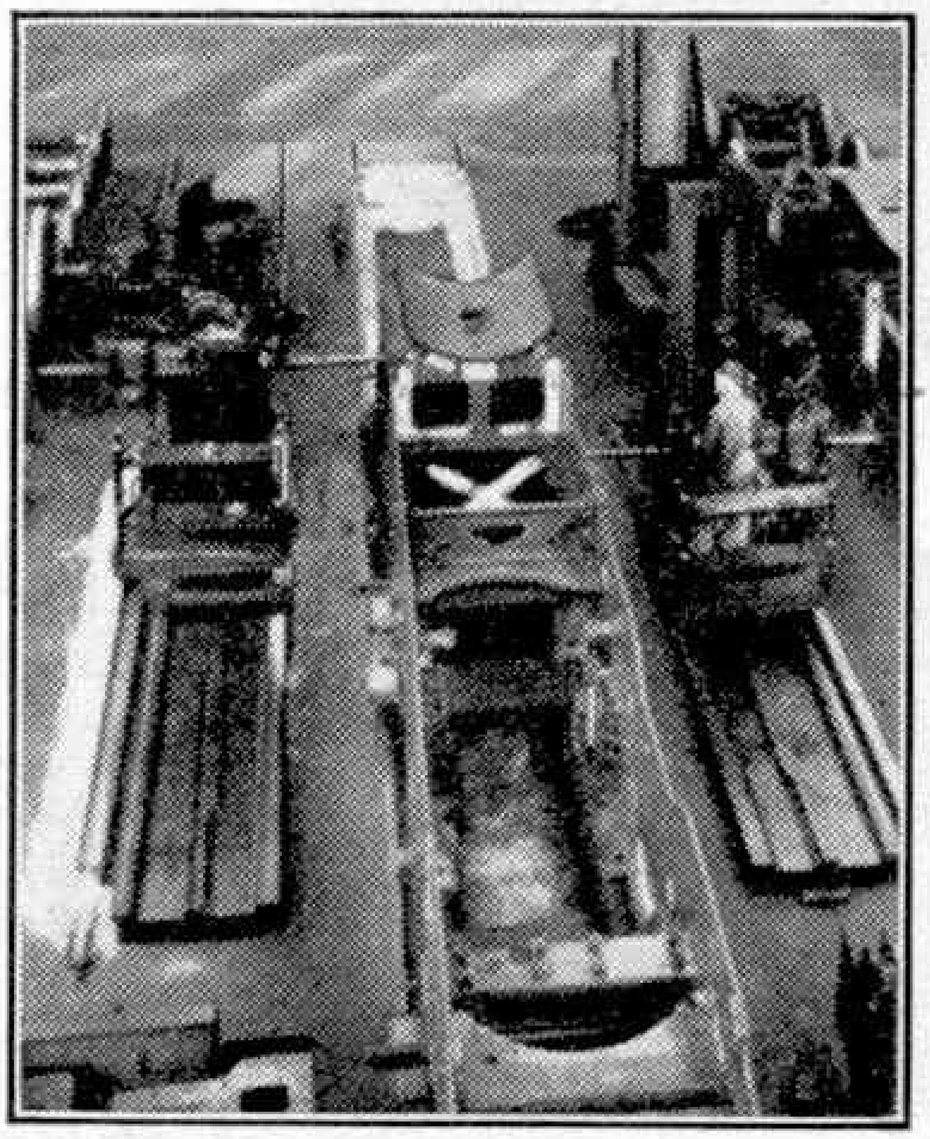


The New B.R. Standard 2-6-2 Tanks

WE illustrate on this page B.R. No. 82000, the first of the new standard 2–6–2 tanks of which 20 are to be built this year at Swindon Works. The Western Region is to receive ten of these engines, the other ten going tó the Southern Region. Like the B.R. Standard 2–6–4 tanks and the "75000" tender 4–6–0s, these new 2–6–2s are able to run on practically every main and secondary line.

The main frames are of stout construction, well stayed, and their arrangement generally follows previous B.R. standard practice. There are two outside cylinders, 17½ in. by 26 in., driving on the centre pair of 5 ft. 3 in. coupled wheels and the 10 in. piston valves are actuated by Walschaerts motion. The general layout of the driving gear resembles that of the standard 2–6–4 tanks.

The boiler, which has a tapered barrel and works at a pressure of 200 lb. per sq. in., follows closely the general design of the standard No. 2 Swindon boiler used on the Western Region "51," "61," "81" and "56" classes. But the top-feed arrangements follow the usual B.R. practice and, moreover, the boiler has a dome. The smoke-box is supported by a saddle and is of the circular "drumhead" type, while the fire-box is of the Belpaire pattern. The smoke-box is self-cleaning, and a rocking grate and self-emptying ashpan are fitted. The footplate arrangements follow as closely as possible the layout already adopted on B.R. standard tender locomotives.



The frames of one of the new 2-6-2 tanks being drilled at Swindon, where 20 of these engines will be completed this year. The upper illustration shows the first of the new engines. B.R. Official Photographs.

The bunker has a characteristic set-in centre section which leaves a good look-out through the rear spectacle glasses for backward running. It carries coal only, three tons of it, while the all-welded tanks carry 1,500 gallons of water.

The weight of the engine in working order is 74 tons 1 cwt.

Making Steel

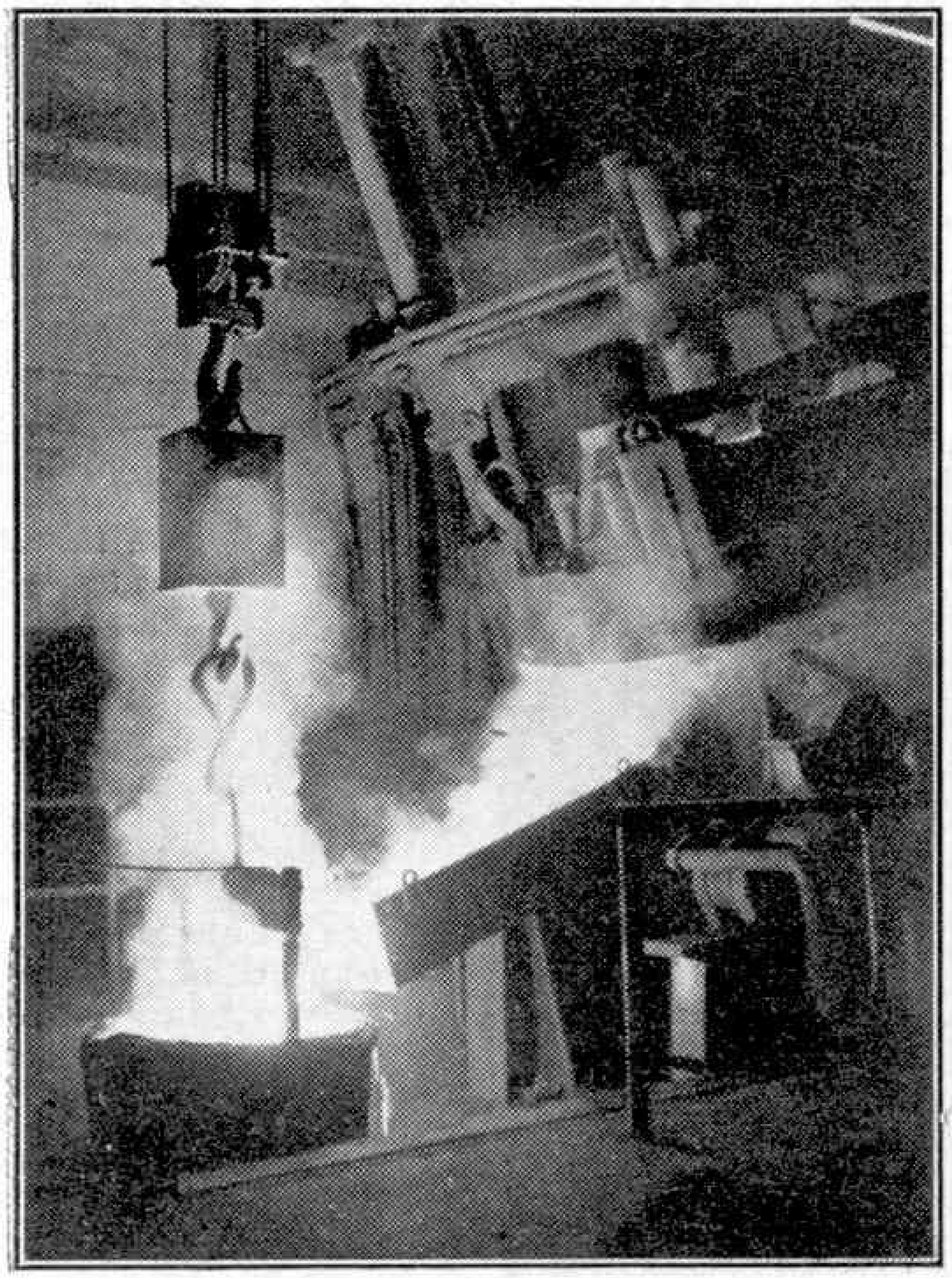
Electric Arc Furnaces at Work

THERE is no more impressive sight in the world than a stream of molten metal pouring out of a furnace. The glare of the metal itself is so dazzling that it hurts the eyes to watch it for more than a few seconds, and its intense heat makes approach to the furnace unbearable.

A striking scene of this kind is shown on our cover this month, which is reproduced directly from a painting by Terence Cuneo showing steel being poured from an electric arc furnace. The surroundings add greatly to the impressive character of the scene. On the left is the arc furnace itself, with its heavy leads for the current, and the thick carbon rods between which the arc is struck that provides the heat for melting the steel. When all is ready for pouring, the furnace itself is tilted, as seen on our cover, and the metal flows out into a large ladle, which is provided with a lining of refractory material capable of standing up to the intense heat of the metal pouring into it.

The ladle in its framework is suspended from a crane, and when it is full it is taken away so that the molten steel it contains can be poured into moulds, where it cools and sets in readiness for further treatment in the long series of processes that in the end convert the steel into cranes and other machines.

The electric arc steel making furnace shown on our cover is one of a group in one of Britain's largest steel foundries, that of K and L Steelfounders and Engineers Ltd., Letchworth. In these many different carbon and alloy steels are produced for making castings for tanks, cranes, locomotives and all manner of engineering products.



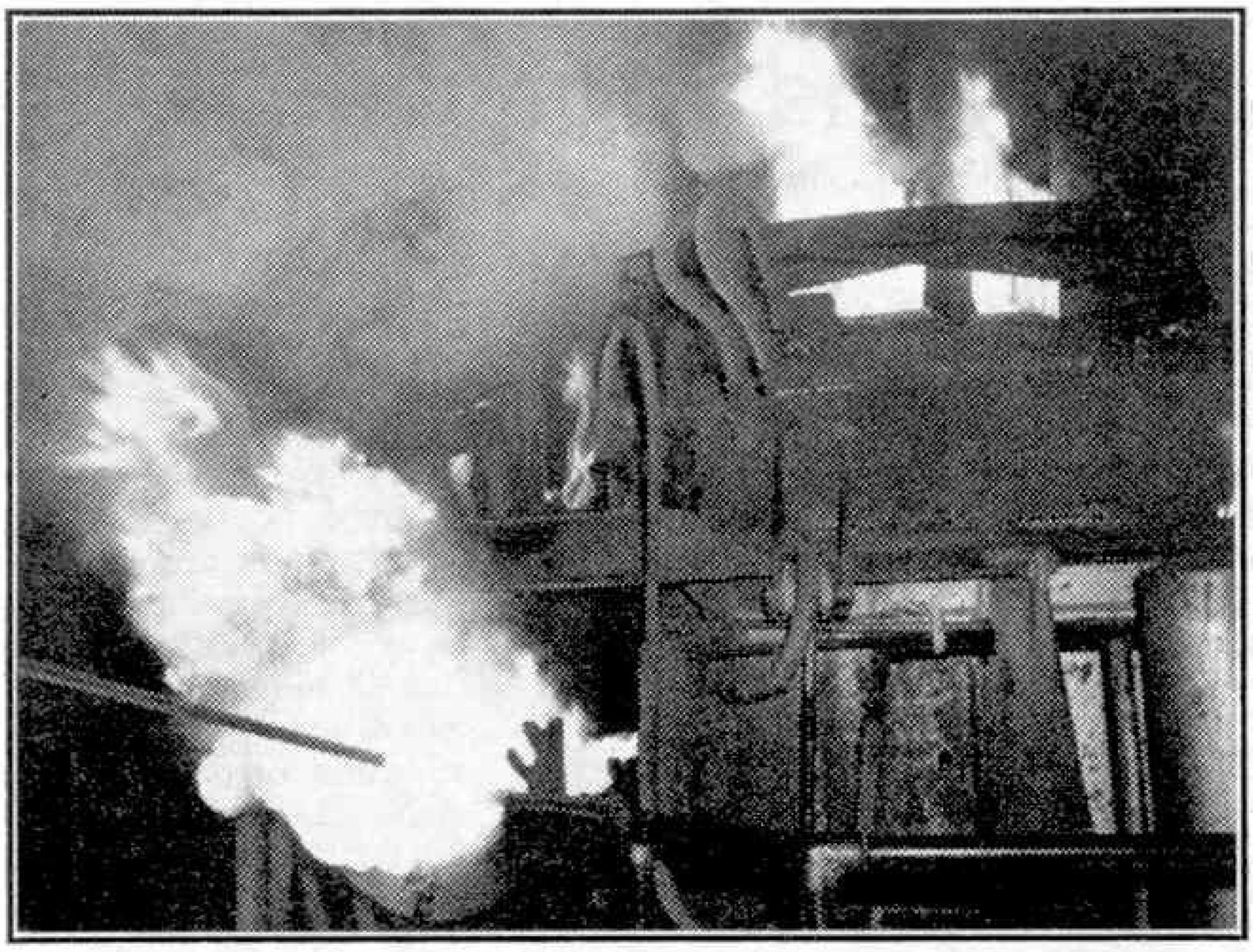
Pouring molten steel from the electric arc furnace into the ladle. Between the crane hook and the ladle is a spring balance, which shows the weight of steel poured. Our illustrations are reproduced by courtesy of K and L Steelfounders and Engineers Ltd., Letchworth.

The furnaces are each of five tons capacity and are powered by 3,000 KVA transformers. They are of the roof swivelling type to permit top charging of raw materials, each charge being carefully made up on the weighbridge from different grades of scrap stored in separate bunkers.

The steel furnace shop is served by overhead cranes of 10 tons capacity that handle everything by lifting magnets or by grabs. In this shop too are the special fires for preheating the ladles, pyrometers for testing the temperature of the steel, and facilities for rebricking the roofs, walls and bath of the furnaces themselves.

The reading of many large text books and years of study are necessary before one can fully understand and practise steelmaking. There are certain fundamentals that are quite easily explained, however.

First of all, sulphur and phosphorus are real enemies of the steelmaker and must be reduced below limits, usually a maximum of 0.06 per cent. Then the proportions of elements like carbon,



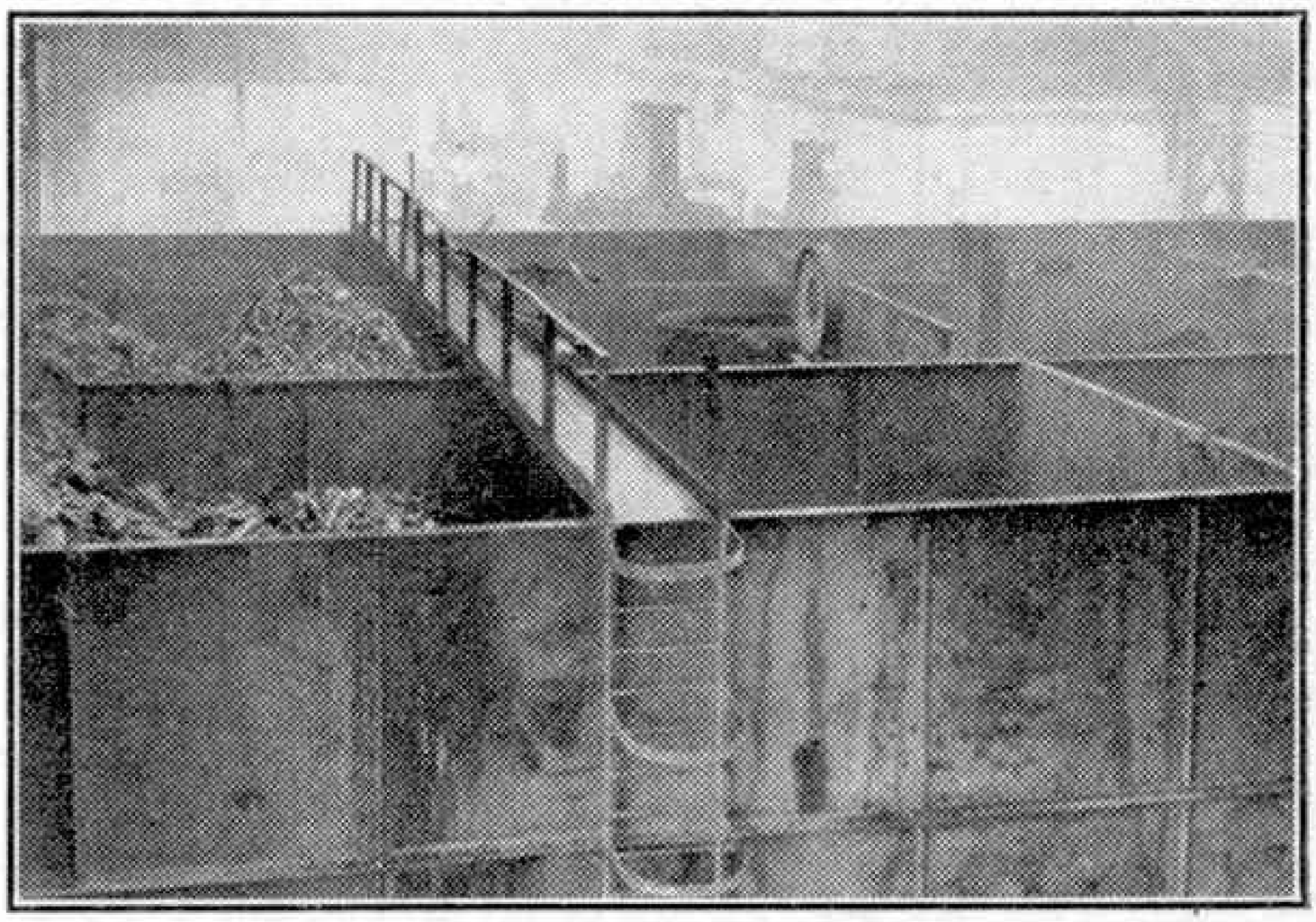
Flames rising from the molten steel as oxygen is injected, by means of the lance seen on the left, during the process of refining.

manganese and silicon must be carefully controlled if the particular steel being made is to have the desired physical properties. A typical steel with a tensile strength of 28 tons per square inch contains 0.15–0.25 per cent. of carbon, 0.30–1.00 per cent of manganese and 0.25–0.60 per cent. silicon, with the already noted maximum of 0.06 per cent. of sulphur and phosphorus respectively. The rest of the steel of course is iron, that is, chemically pure iron, not to be confused with such materials as cast iron and wrought iron.

An alloy steel much in demand today, with a tensile strength as high as 60–70 tons per square inch, contains slightly greater proportions of carbon, manganese and silicon. In addition it contains other metals, from 0.50 to 1.00 per cent. of nickel, 0.40 to 0.70 per cent. of chromium and 0.30 to 0.50 per cent. of molybdenum, and the proportions of sulphur and phosphorus are limited to percentages of 0.03 and 0.04 per cent. respectively.

Furnaces in which these steels are made may be lined with acid material like silica bricks, or with basic materials composed of dolomite or magnesite. With an acid lining, the process is quicker because it consists almost entirely of melting the raw materials, mainly scrap, and of adding any necessary alloys before pouring. One must have available very pure scrap, however, containing low percentages of sulphur and phosphorus. These elements cannot be removed with an acid lining, because materials like limestone and fluorspar, both basic in character, have to be added to form the slag and these would attack an acid lining. Thus with an acid-lined furnace and good quality scrap the process consists really of two stages, melting and finishing.

With poorer scrap, such as mainly has to be used today, furnaces must be basic lined and the process then consists of three stages. These are melting, refining and finishing. The refining stage again can be split into two. The first of these is an oxidising stage, in which the phosphorus is taken up by the slag, with the help of limestone, to form calcium phosphate. The second is a reducing stage, during which the sulphur also is (*Continued on page 382*)

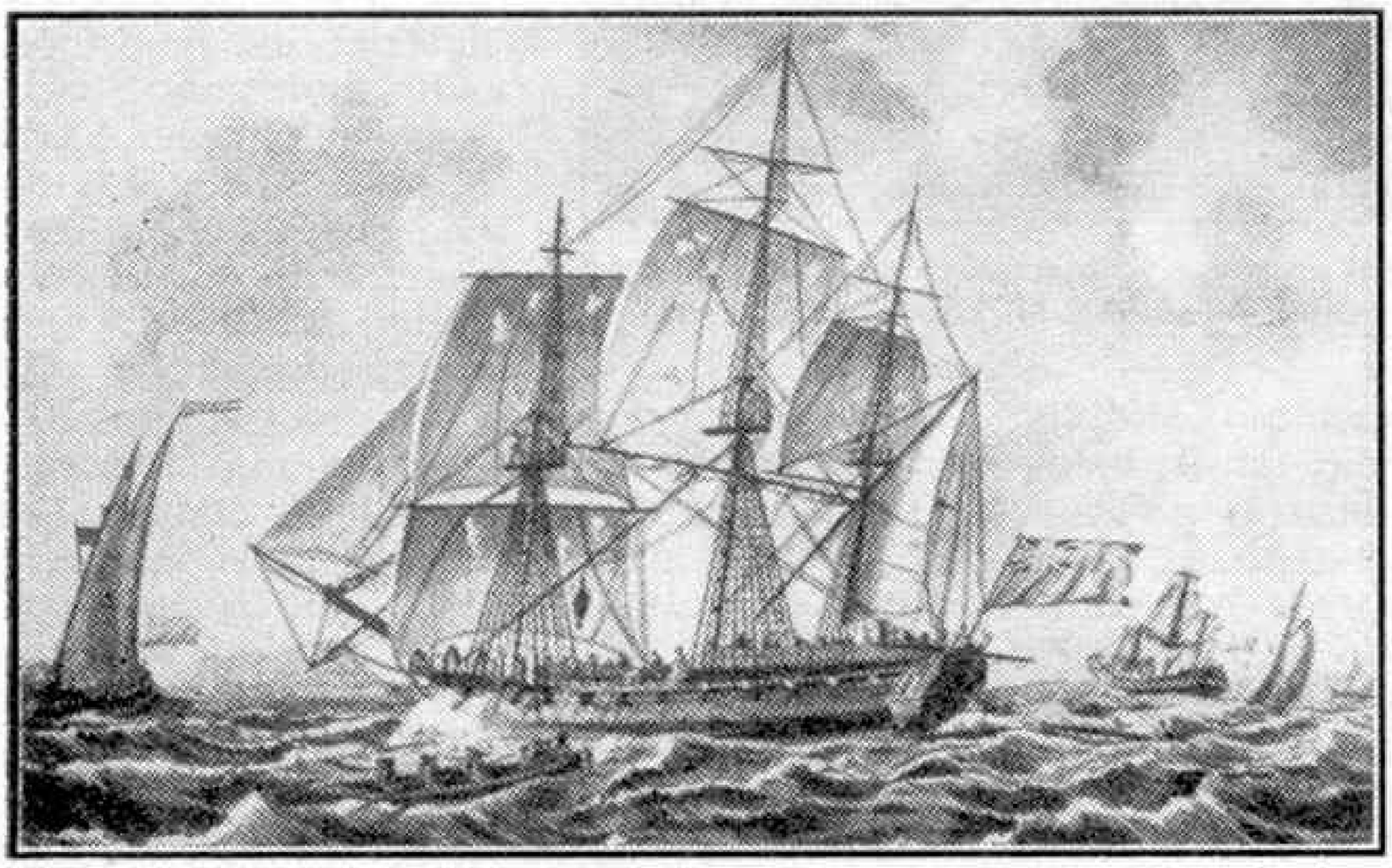


Steel scrap is carefully selected and weighed for making steel in the electric arc furnaces, which can be seen beyond the scrap bunkers shown here.

My Lady the Frigate

By Frank C. Bowen

MOST people picture frigates as romantic vessels of the Eighteenth and early Nineteenth Centuries, under such dashing captains as Cochrane and Pellew. There is indeed no type of warship that so much deserves the feminine label of "My Lady" as this one, with her beautiful fine-lined hull lifting to the waves, her towering canvas and her gallant exploits far away from the depressing influence of staid admirals. No type of man-of-war was more frequently portrayed in print or model, generally by the order of young captains whose fortunes the ships had established by prize money.



H.M.S. frigate Alarm conducting a Spanish prize into Gibraltar in 1781. The illustrations to this article are by The Nautical Photo. Agency.

Such frigates richly deserve their romantic position but, like most other naval types, they passed through many stages of development in which they were scarcely noticed by the layman. The earliest mention of the frigate was as a small passage boat, practically unarmed, which was useful for running despatches or carrying officers who would now be described as Very Important Persons. She depended for her safety on her speed and handiness. Then, in the Mediterranean galley fleets, the fregata—a name easily translated into frigate—was a small fast galley of light draught that was too small to be rowed by slaves and therefore had to have free fighting men at the oars. The Elizabethan pinnaces, which carried out so many daring escapades, were described by the French as "fregates of 50 tons burthen or thereabouts."

The name frigate was not generally adopted in Britain as early as that, however. Sir Robert Dudley, at the end of the Sixteenth Century, appreciated how appropriate a name could be, and when he was compiling a draft book containing his ideas of what types of ship should be included in the Navy he suggested a frigate, a vessel 160 feet long by 24 feet beam carrying a tier of guns on one whole deck, and more on a short poop and forecastle. No ship was built to his ideas in those days, but a century later the design was beginning to attract attention and was in fact the basis of the frigate of popular conception.

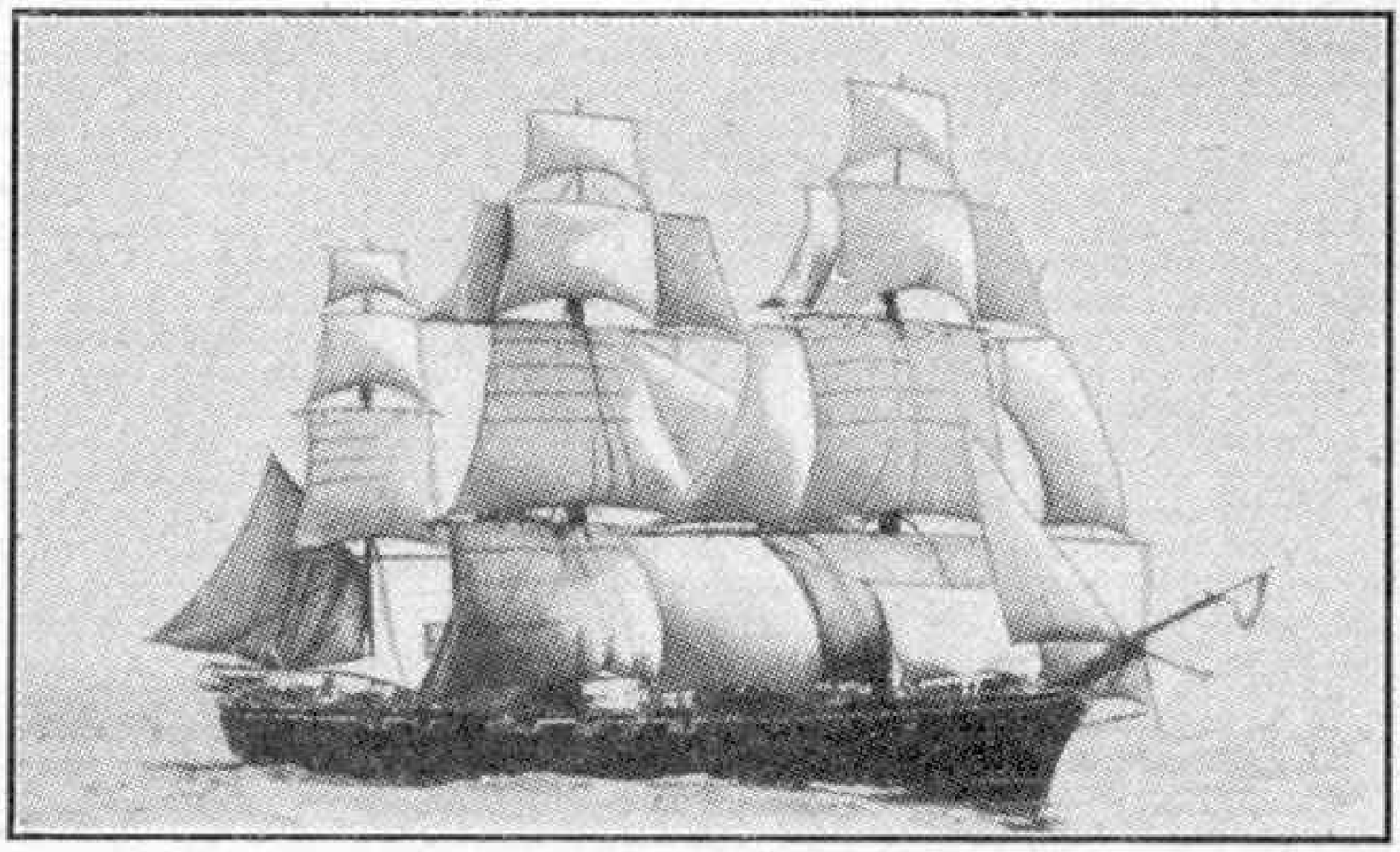
It was apparently the French, who had an Atlantic as well as a Mediterranean seaboard to consider, who transferred the idea from the South to the North and adapted the Mediterranean frigate to the more tempestuous Northern waters, giving her greater tonnage and fuller lines. By then the name had been used in Britain, where most seagoing merchantmen were called frigates regardless of their size, lines and speed. A number of armed merchant ships belonging to the chartered companies were so described at the time of the Spanish Armada, although there was little that was speedy or graceful about their design.

Early in the Seventeenth Century the list of the ships of James I made out in 1604 contains "the French frigate," apparently a prize, of only 15 tons burthen. About 30 years later two ships were listed as frigates, although they seem to have been more like pinnaces or yachts. On the other hand the term frigate was appropriate for the Dunkirk privateers captured by Charles I's Duke of Buckingham, which were famous for their speed.

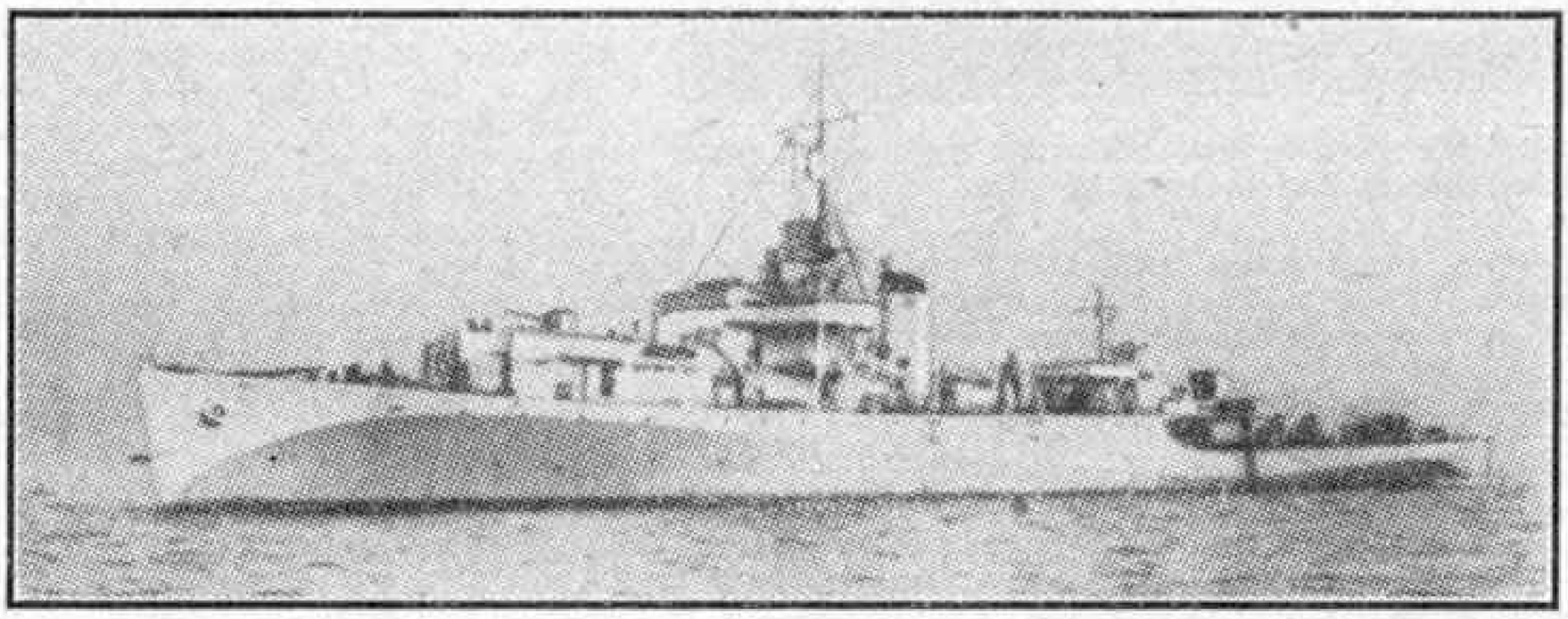
For many years after that the name frigate, as may be noticed in the writings of Samuel Pepys, was loosely applied to nearly all types of sizeable men-of-war, no matter what their design, before it became a regular rating, below the line-of-battle ship and above the numerous small craft, that was the predecessor of the modern cruiser.

The *Constant Warwick*, which Peter Pett designed as a privateer but which was immediately hired by the Navy, is often described as the first frigate, on the strength of the epitaph on Pett's tomb that stated, "He invented that excellent and new ornament of our Navy we call a frigate." She was a little ship of 342 tons burthen mounting 26 guns and when new she was the only ship that could outsail Dunkirk privateers and Algerine pirates. When she was rebuilt in 1666 she was, according to a contemporary naval authority "converted from an incomparable sailer into a slug," so that she was easily captured by a French fleet. In the seven years which followed her completion over sixty vessels were built that were officially described as frigates. Their armament varied from 12 to 80 guns. Most of them were criticised for being so deep in the water that they were unable to carry the stores necessary for a cruising ship and their guns were too near the waterline to be fought in any sort of a seaway.

On the other hand Colbert's school of naval architecture in France made a special feature of frigates, which undoubtedly satisfied the idea of what the ships should be. When the *Superbe* was captured Charles II admired her so much that he ordered her to be copied in a ship which was named the *Harwich* and this was so successful that many others were built on her lines. They were undoubtedly frigates and the name was officially limited to ships of the third to the sixth rate. At the close of the Seventeenth Century the third and fourth rates were labelled line-of-battle ships, fit to fight in the line, and only the fifth—below 50 guns—and sixth rates were classified as frigates.



H.M.S. Volage, 1869.



A frigate of today, H.M.S. Helmsdale, camouflaged to suggest a submarine.

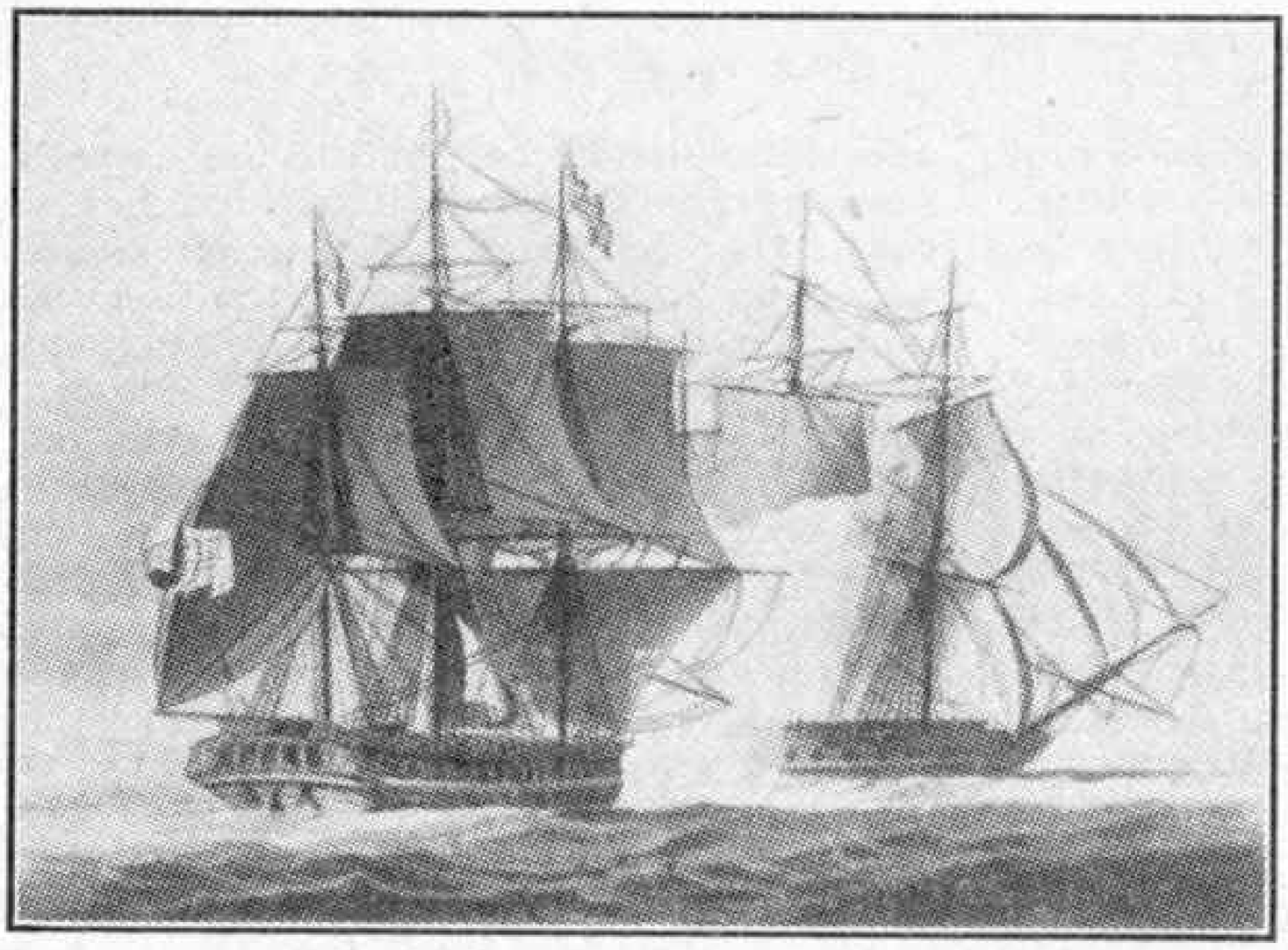
In the early part of the Eighteenth Century the frigates mounted 20, 30 and 40 guns, but there were constant complaints that if the British Navy wanted a frigate that was really fast, and sufficiently weatherly to beat off a lee shore, they had to go out and capture one from the French. The contemporary British ships were badly overloaded with guns for their size, so in 1719 a new scale, or establishment as it was called, was introduced which allowed considerably

greater tonnage for the number of guns in each class.

Normally these ships had only one gun deck, but in 1744 an attempt was made to design a more powerful 44-gun frigate. This carried her guns on two decks and was clumsy and very unsatisfactory for her work. Frigates were not always faster than line-of-battle ships, particularly in heavy weather, but they could generally get away by being able to sail closer to the wind. In any circumstances it was not considered quite sporting for a line-of-battle ship to attack a frigate unless she were too impudent.

So the frigate became the type that captured the imagination then as she does today. Her duties were innumerable. A few were attached to the battle squadrons for scouting and to drive off enemy scouts. Most of them acted independently, protecting merchant ships and attacking those of the enemy, bombarding shore positions, patrolling the trade lanes, and often launching their boats to cut out merchant ships or small craft lying close inshore.

Frigates gave junior captains fine opportunities of showing their qualities out of reach of the admirals. They had to sacrifice some of their prize money to the commander-in-chief of the station on which they had earned it, but a really smart captain with a fast frigate would find a good balance, which is why so many models and paintings of frigates have survived, made to the order of the captains whose fortunes they made. Prize money was also the attraction



The historic fight between the British and American frigates Shannon and Chesapeake during the war of 1812.

that secured a large proportion of prime volunteer seamen for a good frigate under a good captain. Often such a vessel would get her whole crew of trained men without having to employ the Press Gang at all.

All through the Eighteenth and early Nineteenth Centuries there were innumerable duels between single frigates which were fought with desperate gallantry. The handiness of the ships offered much greater opportunity for skill than in the average fleet action, when the line-of-battle ships just got close alongside one another and hammered it out. Many a captain did everything that he could to avoid promotion to a line-of-battle ship.

By the middle of the Eighteenth Century most frigates mounted 28, 32 or 36 guns, and designers were beginning to take the greatest care not to overload them. A typical 28-gun ship was of just over 600 tons and her main battery consisted of 9-pounders. The 32-gun ship was about 100 tons bigger and 26 of her guns were 12-pounders, while the 36-gun ship was of about 730 tons. Their crews would vary from 200 to 240 men.

The new 38-gun type was introduced in 1780. The first was of just over 900 tons, but they soon exceeded 1,000 tons. In 1792 the first 40-gun frigate was built, carrying thirty 18-pounder guns and ten 9-pounders, the latter being afterwards exchanged for sixteen 32-pounder carronades, which were short guns capable of doing tremendous damage at short range only. In those days, it has to be remembered, the legend armament of a ship did not indicate the guns that she actually carried; carronades were left out of the calculation and even long guns were often ignored. A 40-gun frigate might easily carry 50.

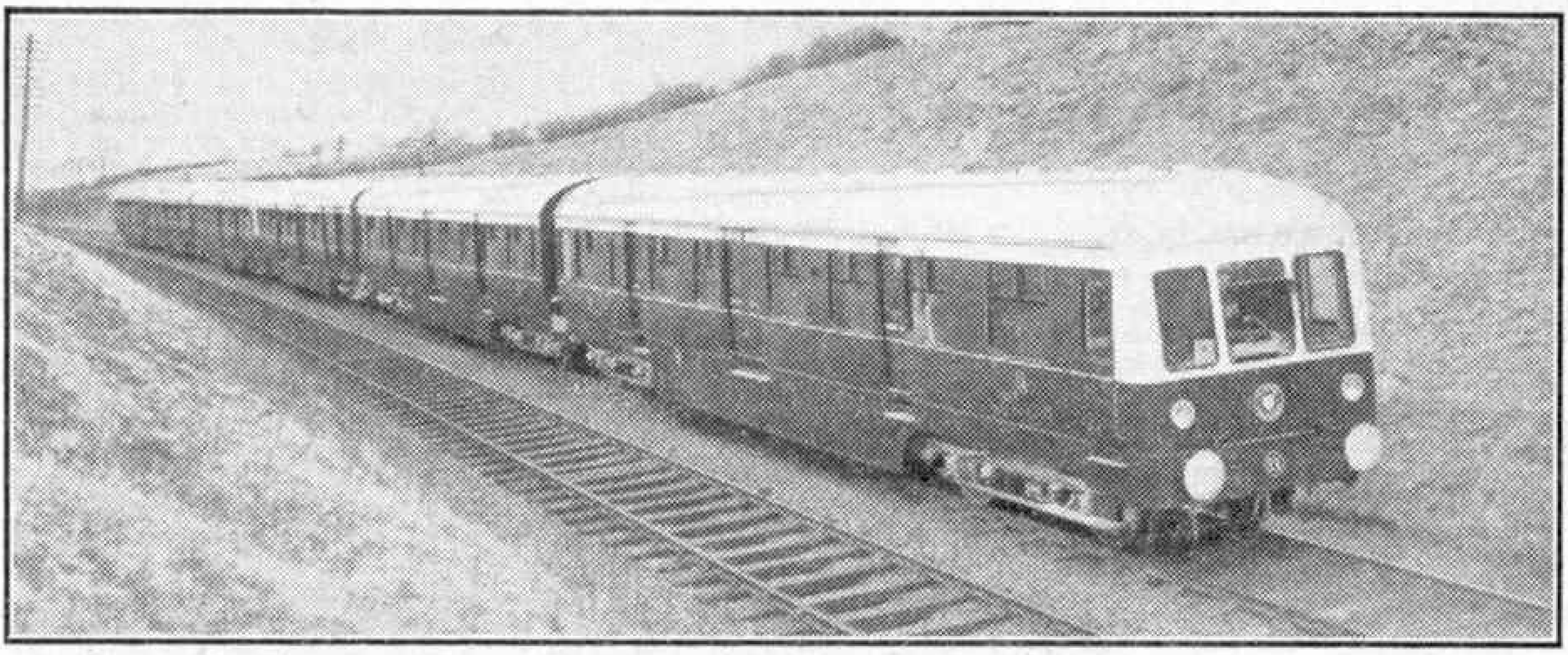
At the end of the century the Americans, whose Treasury would not run to the construction of line-of-battle ships, revolutionised frigate design with their famous 44-gun type, which often actually carried thirty-two long 24-pounders and twenty-two 32 pounder carronades, yet were so well designed that they lost none of the frigate's handiness and speed. Owing to the neglect of staff work by the British Admiralty, these ships passed almost unnoticed until the War of 1812 broke out, when the Royal Navy had nothing to touch them and several frigates of normal strength were captured. The Admiralty ordered forty ships mounting from 38 to 50 guns by contract, but they were built of softwood without proper seasoning and the best of them were falling to pieces and broken up within fifteen years, many of them indeed within ten.

After Waterloo the Admiralty set about designing ships of this type with the greatest care and building them of the best materials; these ships were a great success and did splendid service as the flagships of distant stations. A 50-gun frigate in the 'thirties would be of more than 2,000 tons, mounting a few 8-inch shell guns and a number of 32-pounders so that they could stand up against many line-of-battle ships.

By that time steam had been introduced into the Navy's smaller fighting ships. To begin with they had to be paddlers, so that their motive power was terribly vulnerable and the space amidships occupied by the machinery and paddles prevented the mounting of the ideal frigate's armament of numerous light guns. Instead the paddlers were given a few of the biggest guns in the fleet on deck. If they carried nothing else they were sloops, but if they had a few smaller guns on the deck below they were frigates. They were useful for bombarding, or for towing the sailing line-of-battle ships, but they could not fulfil the frigate's duties.

When the screw propeller was made reasonably efficient, in the 'forties, it was fitted into a number of broadside frigates and some excellent ships were built. The combination of screw and sail was continued until the end of the 'seventies, although complaints were made that many of the bigger ones were given "smasher" guns designed for use against ironclads which they were never likely to fight on account of their having no armour.

The paddle frigates were given that name in default of a better idea and the same thing happened during the Second World War. For the War of 1914-18 convoying and general purpose vessels had been introduced and named sloops. Before the Second War a smaller type was built and named the corvette, although in the old days the corvettes were bigger than the sloops. When something with greater power and longer range was needed the name frigate was revived, in 1942. The first frigates were named after rivers and were of about 1,450 tons, with a speed of 20 knots given by geared (*Continued on page 382*)



A "Multiple-Unit" Diesel Train

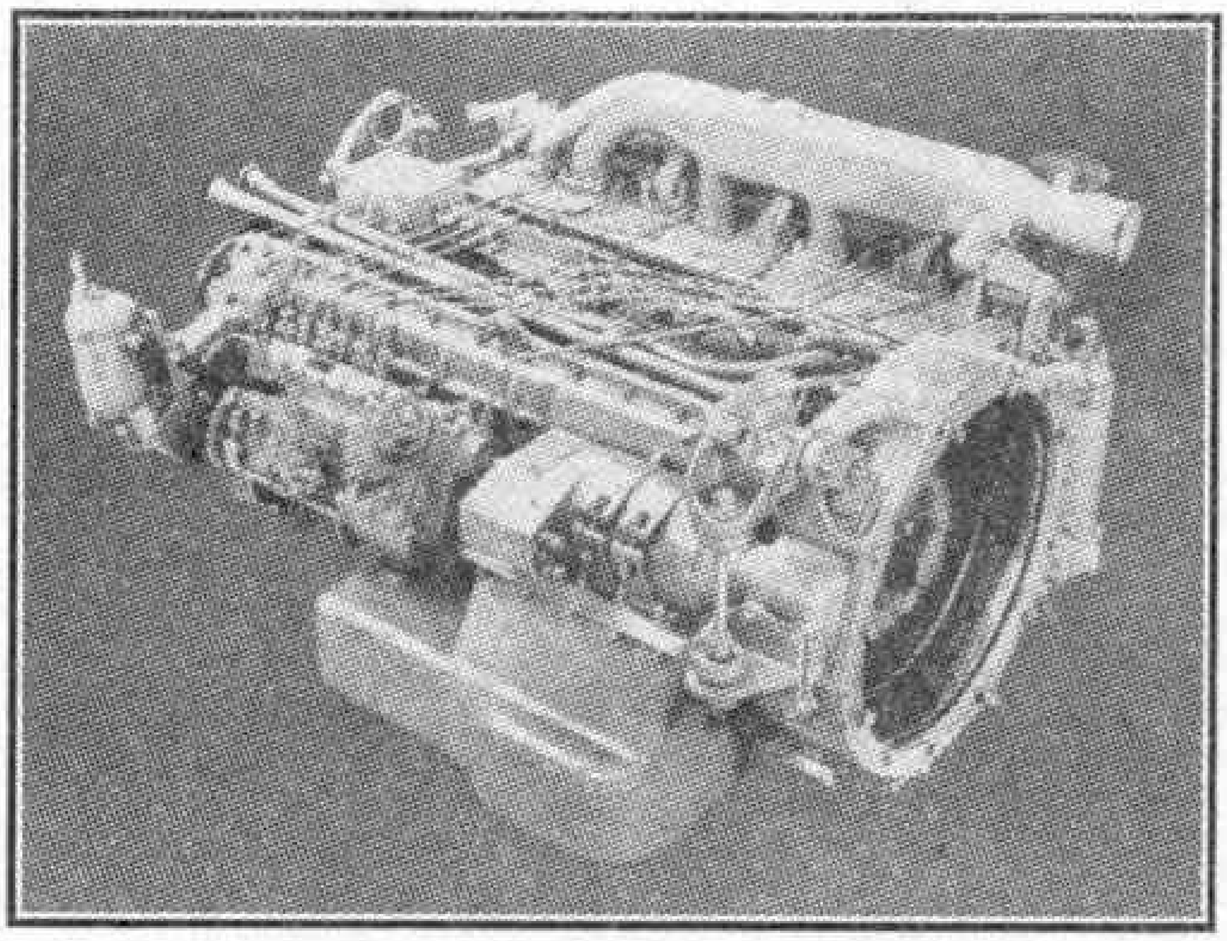
WE are all familiar with the multiple-unit electric train with several motor-fitted coaches distributed in its make-up, all controlled from the motorman's compartment. Diesel-electric locomotive units too are frequently coupled under single control, especially in America; and now in Northern Ireland there is a train that provides an interesting instance of the application of multiple-unit control to a number of diesel-engined coaches with mechanical transmission.

The Ulster Transport Authority began its experiments with a three-coach set of this kind running between Belfast and Bangor, County Down. Then came the six-coach train of four power vehicles and two intermediate trailers shown on this page. The train can easily be split into smaller combinations as required, or increased in length quickly to eight coaches. Further trains on similar lines are being constructed.

The power coaches have been converted from existing centre corridor stock, and each is fitted with two Leyland diesel engines driving the inner axles of the bogies. Gearless torque converters and short propeller shafts take the drive to auxiliary gear-boxes, each in turn connected to its axle by another shaft. The power plants and equipment are in the coach underframe, leaving the floor area of the coaches free.

Many difficulties had to be overcome to make sure that the several power units of the train worked together. One reason for this was the great distance, a tenth of a mile in a train of eight coaches, between the driver in his cab and the engines and transmission in the coach at the rear. To overcome these difficulties the Ulster Transport Authority, Leyland Motors Ltd., and Walker Bros. (Wigan) Ltd. pooled their technical resources. The wiring system includes about 12½ miles of electric cable. Current is supplied by batteries.

Indicator lights on the control panel show whether the forward and reverse pinions in the final drive have responded to the movement of the switch. The panel also carries stop and start buttons, revolution counters, speedometers and various gauges. The Westinghouse air brake is provided, with electro-pneumatic equipment giving simultaneous application along the train.



Here is one of the Leyland engines of the six-coach diesel train described on this page, and the train itself is seen at the head of the page. Photographs by Leyland Motors Ltd.

Air News

By John W. R. Taylor

S.B.A.C. Display

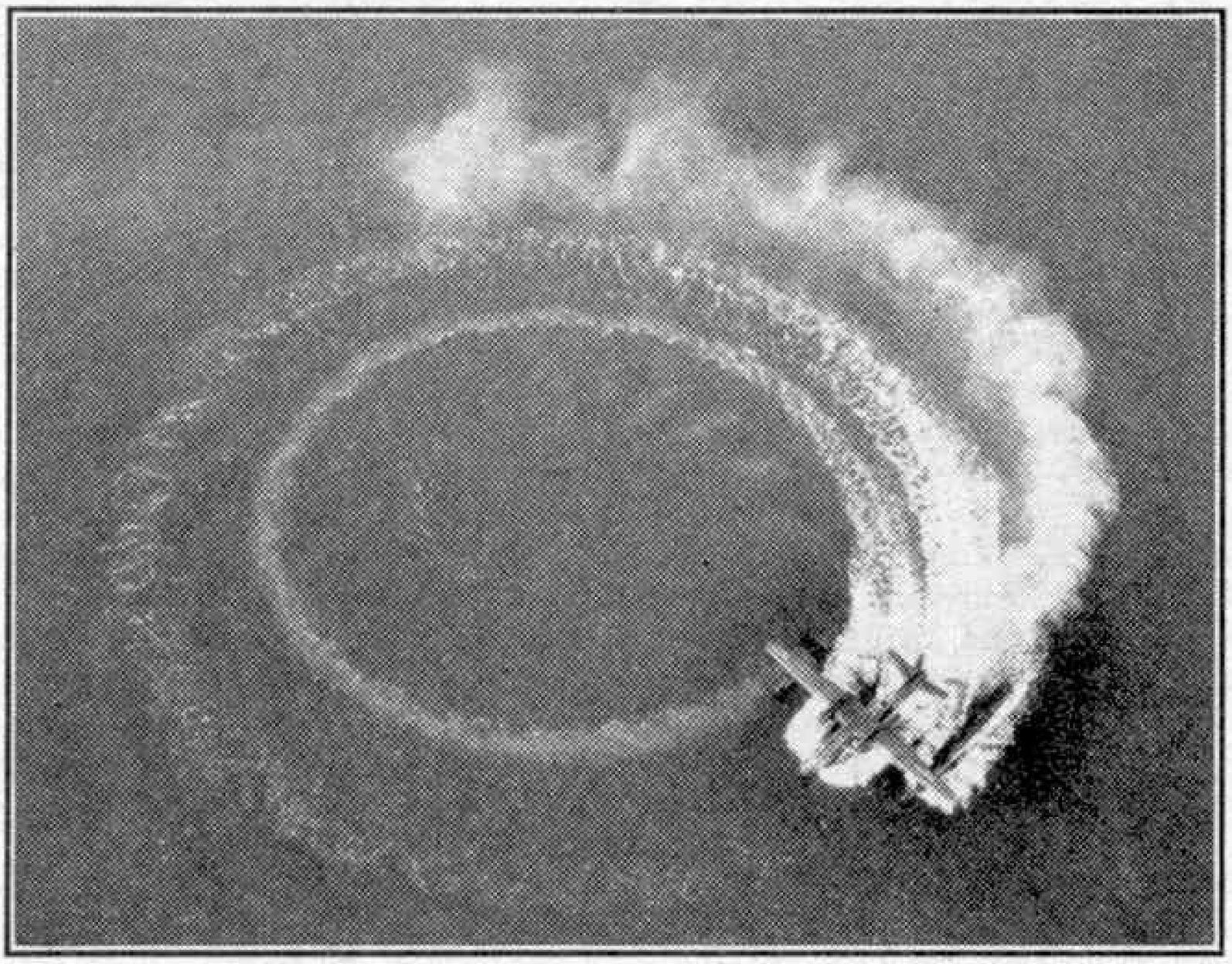
Britain's latest and finest aircraft, aero engines and equipment will once again be on show next month at Farnborough Airfield, Hants., when the Society of British Aircraft Constructors put on their 13th Flying Display and Exhibition. Among this year's highlights will be demonstrations of the new Avon-powered Comet series 2, the formidable Gloster GA.5 delta and de Havilland 110 twin-jet all weather fighters, the Bristol Britannia propjet air liner, Bristol 173 twin-engined helicopter, our latest big jet bombers and the R.A.F.'s new sweptwing jet fighters, the Swift and Hunter, which will probably fly at speeds faster than the present world speed record of 670.981 m.p.h.

For the first four days, the Display will be open only to guests of the S.B.A.C; but members of the public will be welcomed on Friday, Saturday and Sunday, 5-7th September, when the flying programme by Britain's leading test pilots will be the same as on the private days.

Chasing its Tail

The interesting photograph on this page shows the prototype Martin Marlin flying boat demonstrating its ability to make tight turns on the water by use of its hydroflaps. The picture was taken from a U.S. Navy helicopter, hovering over the site of the tests.

Hydroflaps are combined underwater rudders and brake developed by Martin engineers to make possible quick turns and faster manœuvring in restricted waters. They are located on each side of the aeroplane's hull near the stern, and are operated hydraulically from the cockpit. The hydroflap angle may be set as great as 65 degrees, as shown above, to give a turning radius of about 1½ times wing-span. Using engines alone, a Marlin would need about three times as much water to turn in.



Martin Marlin flying boat making a tight turn on the water by using its hydroflaps. Photograph by courtesy of the Glenn L. Martin Company, U.S.A.

The Silver Wing

Twenty-five years ago Imperial Airways inaugurated their Silver Wing luxury passenger service from London to Paris, using specially-equipped Argosy air liners. Now British European Airways have adopted the same name for their daily lunchtime services between the two capitals, operated by the new *Elizabethan* class Airspeed Ambassadors.

Imperial Airways' Silver Wing service was the first to carry a steward to serve the Argosy's 18–20 passengers with luncheon and refreshments in flight. The Silver Wing *Elizabethan's* 40 passengers are served by two stewards and a stewardess. The Argosy's three 420 h.p. Jaguars gave it a cruising speed of 95 m.p.h., so that the journey from Croydon to Le Bourget took 2 hr. 50 min. The *Elizabethan's* two 2,600 h.p. Centaurus motors whisk it to Paris in 90 min. at 245 m.p.h. The only thing, in fact, that has not changed is British Airways' tradition of unrivalled comfort, safety and service.

Parasite Fighters

The U.S.A.F. are continuing their experiments with air-launched fighters, by carrying Thunderjets in the bomb-bays of B-36 ten-engined heavy bombers and releasing them during flight. They have not stated whether the Thunderjets are intended to protect the bombers or to support the attack of the "heavies" by making low-level precision raids with small atom-bombs.

Farmers Make Sheep Air-minded

To prepare 100 of his sheep for an 8,000-mile flight to Israel, an Australian grazier built on his farm a full-size mock-up of a freight aeroplane, fitted with pens inside its cabin, each complete with food and water containers and painted in different colours. After a few days, the sheep entered their own pens when called, and remained there all day. As a result, when the B.O.A.C. York transport arrived, with similar pens in its cabin, they trotted aboard quite happily and were in their new homeland almost before they had time to realise they were on the move.

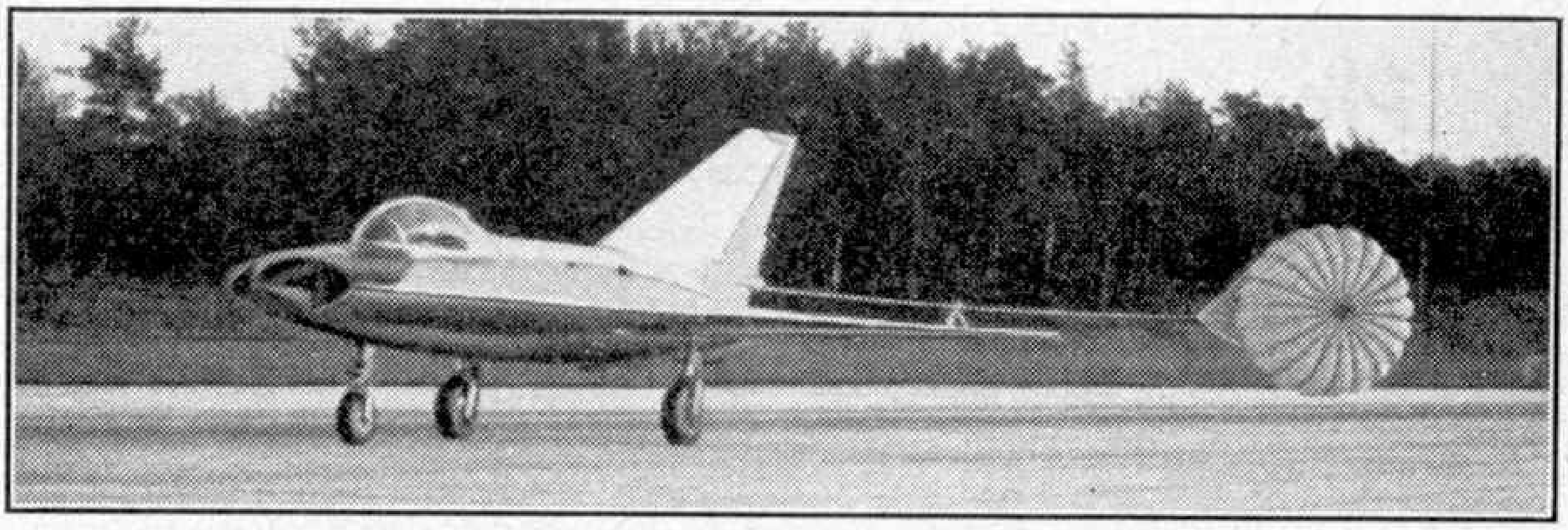
Viscounts for T.A.A.

Trans-Australia Airlines have ordered six Vickers Viscount air liners, at a cost of about £1½ million. Delivery will begin in 1954. Australia thus becomes the first country outside Europe to order propjet air liners, following the lead of B.E.A., who hope to receive the first of their fleet of 20 Viscounts in October. Other Viscount operators will include Air France and Aer Lingus, who have ordered 12 and four respectively.

* * * *

The Armstrong Siddeley Sapphire turbojet has passed the British type-test at an output of 8,300 lb. thrust. This makes it officially one of the world's most powerful aero engines. The Sapphire, which is in production in both Britain and America, powers the Gloster GA.5 delta fighter and the American-built version of the Canberra bomber.

As far as is known, the only engine developing more power than the Sapphire is the Bristol Olympus turbojet, which has been type-tested at 9,750 lb. thrust.



Saab 210 Draken, the first Swedish delta-wing jet aircraft. Note the special drag parachute to reduce the landing run. Photograph by courtesy of Svenska Aeroplan A.B., Sweden.

U.S. Navy Adopts British Catapult

The Royal Navy's new steam-operated catapult, designed to launch carrier-based jet 'planes quickly and safely, has been adopted by the U.S. Navy, following demonstrations of the catapult in U.S. waters by H.M.S. *Perseus*. In all, 140 test launchings were made, using deadweights and the latest types of U.S. carrier-based jet fighters and atom-bombers.

First installation of the "steam slingshot" will be on the U.S.A. *Hancock*. Later, it will probably be fitted to the giant flush-deck carrier, U.S.S. *Forestal*, which is now under construction. It uses the principle of the slotted cylinder, containing a piston. A hook on the aircraft is connected directly to the piston, which is then driven along the cylinder by high pressure steam from the ship's boilers. A novel sealing device keeps the cylinder steam tight, and the catapult is so powerful that it can launch off jets and heavy bombers even when the carrier is heading downwind or moored alongside a dock. It thus reduces the vulnerability of carriers to enemy attack, as they no longer have to steam out of line to launch their aircraft into wind.

Sweden's First Delta

The little jet-propelled Saab 210 Draken illustrated above is one of the most advanced and unusual aeroplanes ever built. Unlike other deltas, it has a very wide, flat, aerofoil-shaped fuselage, which not only houses an unusually large amount of fuel and equipment but also produces much of the aircraft's lift. Its wings are simply small triangular "flippers" tacked on at each side.

The Draken has been designed for research, under Royal Swedish Air Force contract. But the conical projection at its nose, between the air intakes, suggests a radar installation and, as Saab are known to be building a powerful new all-weather fighter, it seems logical to assume that the Draken is a small-scale flying "model" of that. It is powered by an Armstrong Siddeley Adder turbojet and, despite its small size, has a retractable tricycle undercarriage and an ejector seat for its pilot.

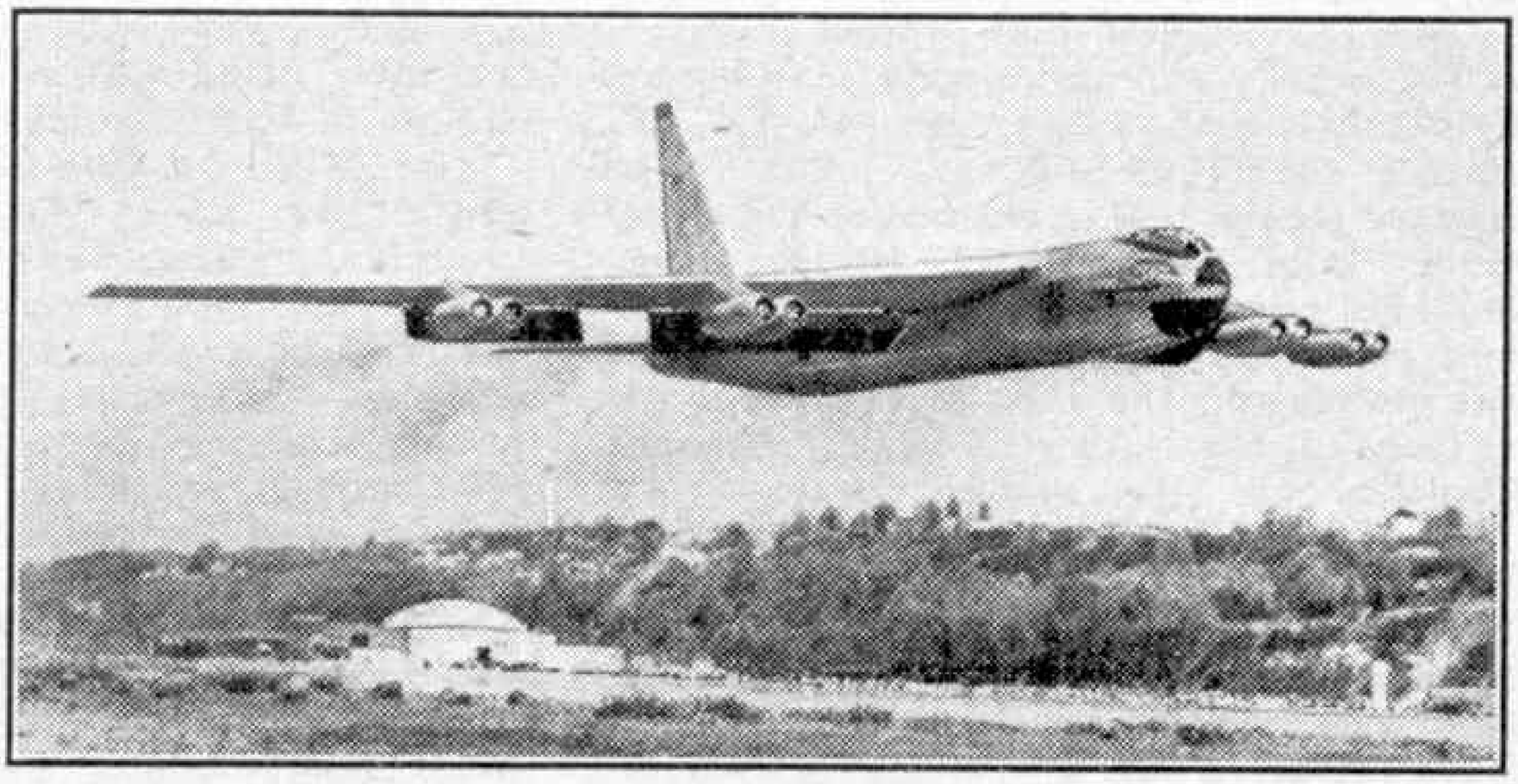
Radio Direction Finder

British test pilots are using a new radio direction-finder navigation aid, developed by the Marconi company, which gives them almost instantaneously at any time a course to fly to bring them safely back to their base. By reducing navigation problems, it enables the pilots to concentrate on all-important handling and performance tests.

The direction finder is basically a pointer swinging slowly round a dial marked off in degrees, and looks rather like a large compass. The pilot merely calls up the control tower by radio, asks for a course to steer to get him back home, and the pointer swings instantly round to the correct bearing. The complete equipment is about the size of a television set, and repeater dials can be set up anywhere on the airfield. It is so accurate that de Havilland test pilots have been picked up and brought home to Hatfield from as far away as the Dutch coast and Paris.

The Boeing Stratofortress

The lower photograph on this page shows the eight-jet Boeing YB–52 Stratofortress bomber starting its maiden flight from Seattle to Moses Lake Air Force Base on 15th April last. This machine has been developed from the smaller six-jet B–47 Stratojet, the U.S.A.F.'s standard medium jet bomber, and is powered by eight of the powerful new Pratt and Whitney J-57 axial-flow engines. It is now under evaluation by the U.S.A.F. in competition with the Convair YB–60. The winner will go into large-scale production, to replace the U.S.A.F.'s present B-36 jet-and-piston engined long range atom-bombers.



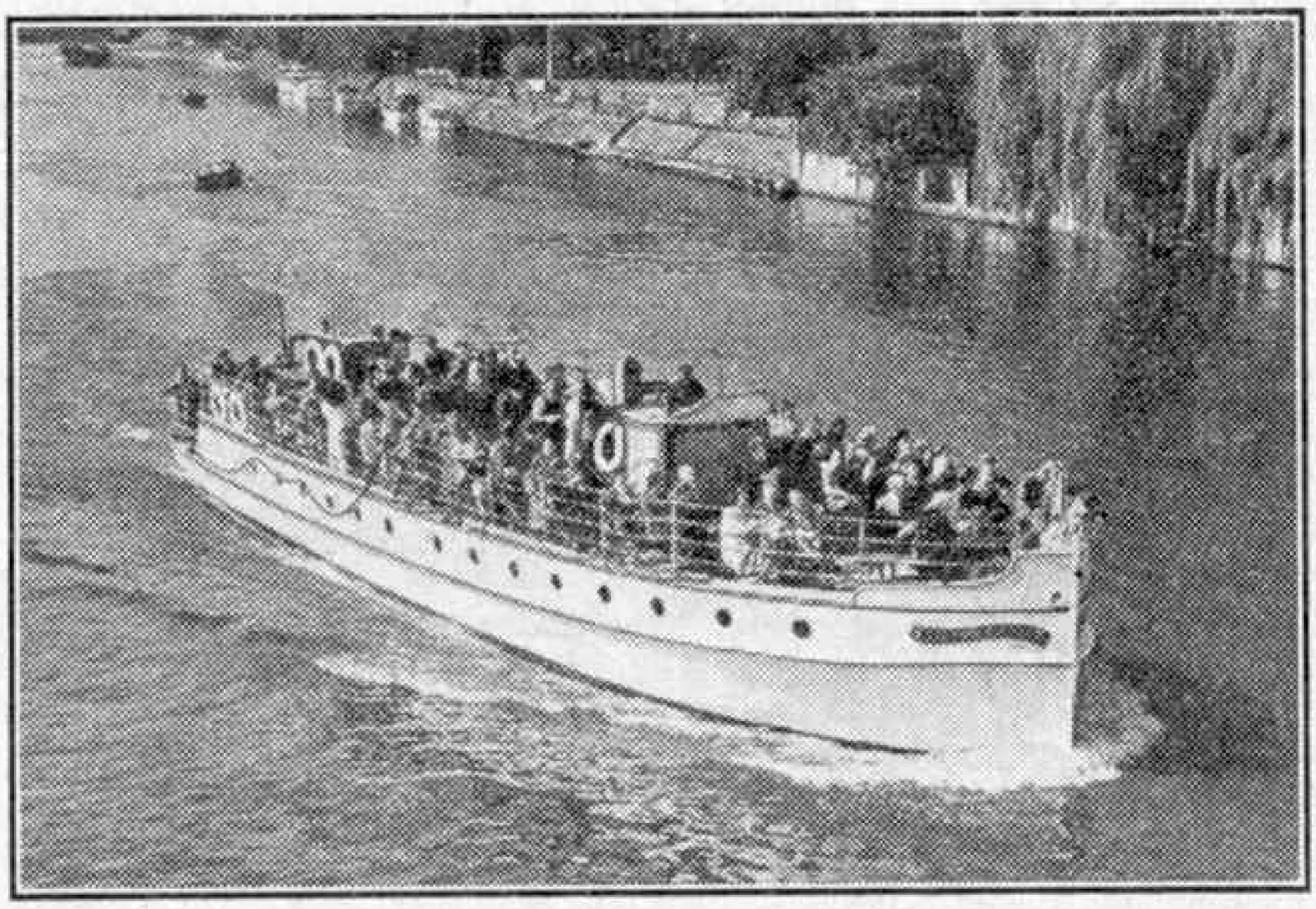
The eight-jet Boeing YB-52 Stratofortress bomber taking off on its first flight. Photograph by courtesy of Boeing Airplane Company, U.S.A.

Pleasure Fleets of the Thames

By Arthur Nettleton

FOR hundreds of years Old Father Thames has provided a highway into the heart of Southern England, and today the river carries ships of many kinds, from ocean-going liners and cargo vessels to barges, tugs, lighters, and pleasure craft in great variety.

During the last 80 years or so, indeed, seeing London and Thames-side from the waterway itself has become a popular idea among tourists and holidaymakers, and the fleets of large pleasure launches making regular sailings as far upstream as Oxford now form an important feature of the Thames transport system.



The Clifton Castle, a popular Thames pleasure launch. She was originally on the Dart, in Devonshire, but now runs between Hampton Court and Richmond.

Twice-daily sailings operate in Summer between Kingston and Oxford, and the service covers 90 miles of lovely river scenery on the higher reaches of the river, while from Westminster Bridge other launches ply to and from Kew, Richmond and Hampton Court, and downstream to Greenwich and the Port of London.

Two of the largest Thames pleasure launches are the motor vessels *Queen Elizabeth* and *Abercorn*, each with a Ministry of Transport passenger capacity of 375. Both vessels are 110 ft. in length, have a beam width of 16½ ft., and are driven by single screw Diesel engines, but have a draft of only 3 ft.

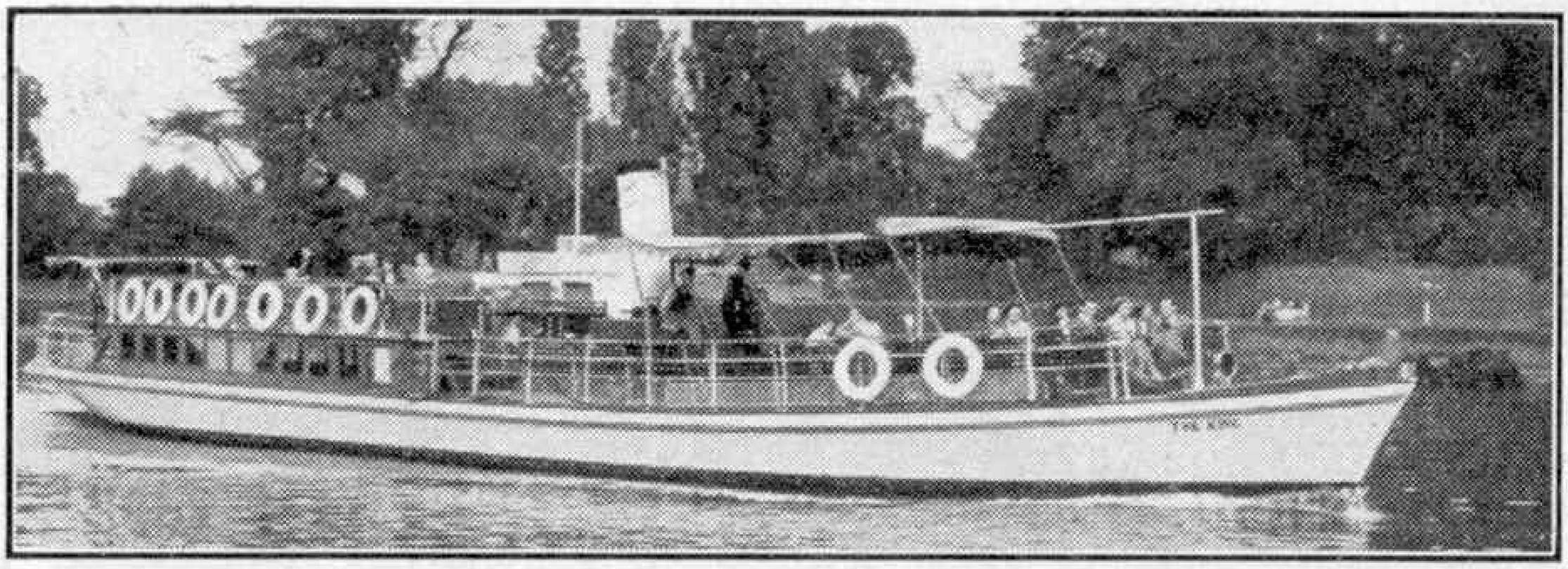
The shallow draft of the large launches is one of their characteristics, and is necessary to ensure regular sailings, since at low water the depth of the river between Richmond and Kew may be no more than a yard! The M.V. *Connaught*, accommodating 350 passengers, has a draft of a mere 2½ ft.

Vessels with a 5 ft. draft are in service, however, although at certain states of the tide they have to wait for a rise in water. In this class are the S.S. *Viscount* and M.V. *Petersham*, the latter powered by a Thornycroft six-cylinder Diesel engine of 75 h.p. The *Viscount*, with a 150 h.p. vertical steam engine, has a maximum speed of 11 knots, which is attained also by the M.V. *Kingwood* and the M.V. *Royalty*, both capable of carrying 350 holidaymakers in comfort.

There is romance in the names of some of these vessels, and other ships have had an interesting history. Hundreds of thousands of tourists have traversed the Thames aboard the M.V. *The King*, which has been carrying sightseers on London's river for 50 years. Originally she was a steamship, but two or three years ago she underwent reconstruction and was later fitted with a 75/90 h.p. Diesel engine at Thornycrofts.

The M.V. *Cardinal Wolsey* is named after the great sixteenth-century Churchman who built the magnificent Hampton Court Palace, a stately home that can be reached by Thames pleasure launches. The vessel has had a unique history, having been built in France. She carried sightseers on the Seine at the pre-war Paris Exhibition, and was afterwards bought for service on the Thames. During the 1939–1945 War she was adapted as a fire float for use on the Thames, and for this purpose she was fitted with pumping machinery, but had her propelling machinery removed.

She is a comparatively small pleasure



launch, with a length of only 69 ft., but her draft exceeds that of the larger M.V. *Queen Elizabeth*. She is now driven by two Thornycroft engines of 75 h.p. and has a maximum speed of about nine knots.

Another passenger launch that came to the Thames from another river is the *Clifton Castle*, which was originally used on the River Dart. When taken over for the run between Hampton Court and Richmond, this vessel had three 4-cylinder engines, each of 30 h.p., but before being put on the Thames service these were replaced by two 55 h.p. 6-cylinder Diesel engines with oil-operated reverse gears.

An interesting point is that the engines have been re-rated; the normal rating of this type of engine is 75 h.p., and the reduction has been necessary because the shallow draft of the launch entails propellers of small diameter. A similar reduction was also called for when the M.V. *Windsor Castle* was equipped with diesel propulsion in place of her original steam engine. This vessel serves Windsor, Marlow, Maidenhead and other places on the upper reaches of the Thames.

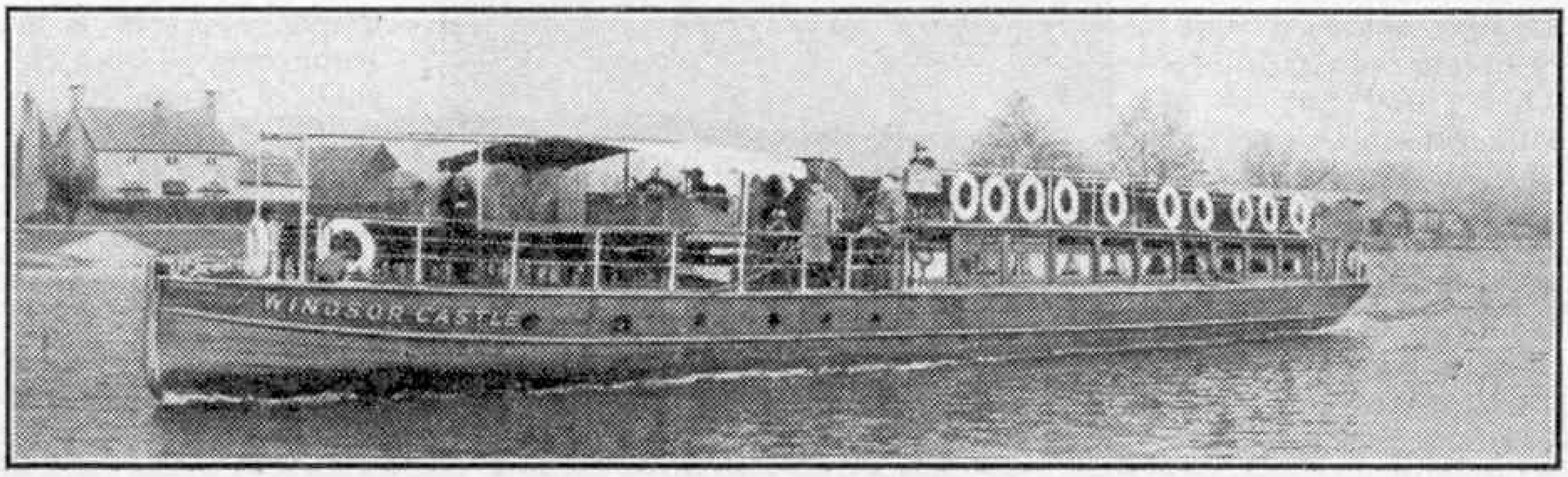
The King, seen at Twickenham in the illustration at the head of the page, is one of the oldest pleasure launches on the Thames. She has a teak hull and carries 196 passengers. Below is the Windsor Castle, in service on the upper reaches of the Thames.
These illustrations, and the one on the opposite page, are reproduced by courtesy of John I. Thornycroft and Co. Ltd.

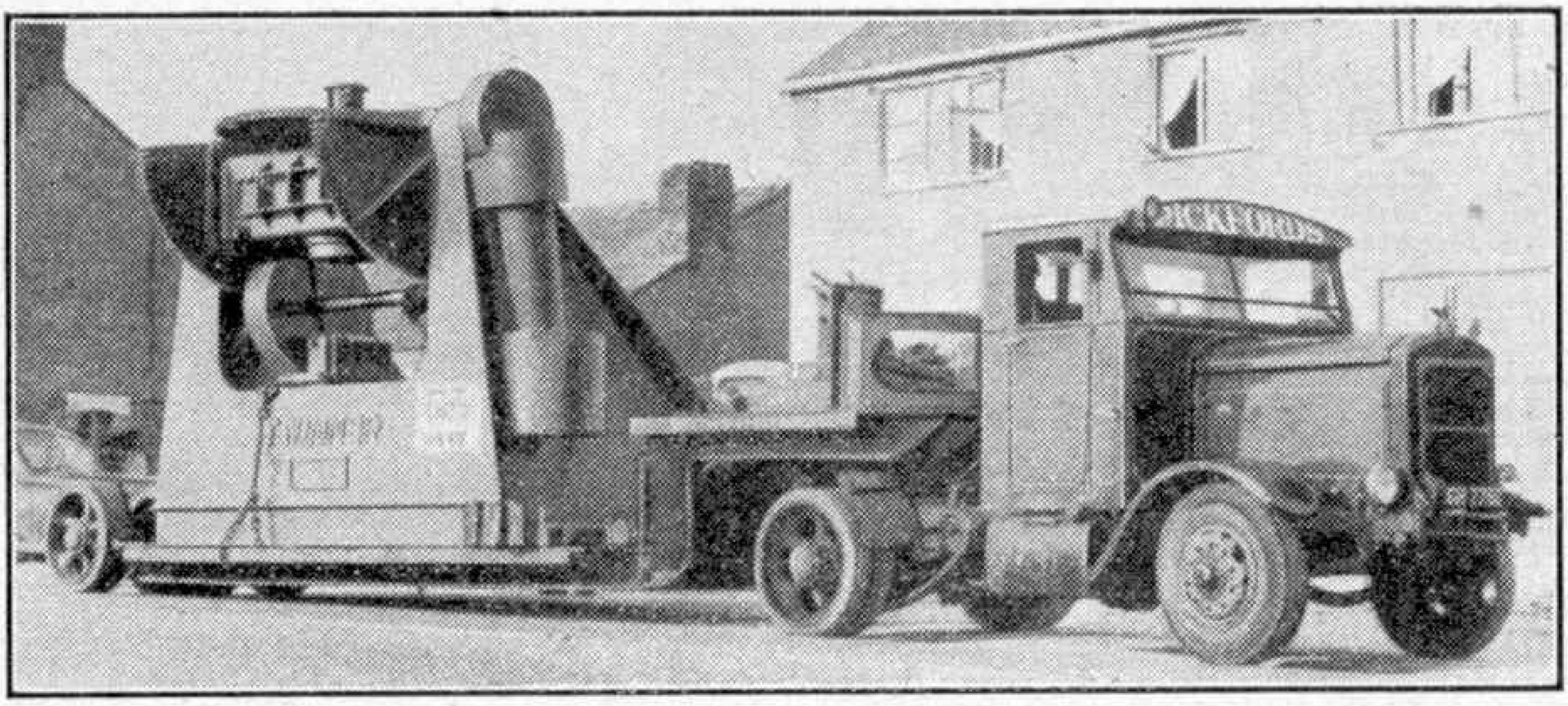
The skippers of Thames launches are all licensed Watermen and Freemen of the River, and as professional Watermen they are entitled to scull in the annual race for Doggett's Coat and Badge during the last year of their apprenticeship. This classical contest takes place each August, and was first held in 1716.

The course is from London Bridge to Chelsea, and the event helps to keep alive the old traditions of the River. The prize is an orange-coloured coat and a badge representing the white horse of Hanover. The winner nowadays also receives £10.

It is fitting that such a competition to test the skill of Thames Watermen takes place just at the time when holidaymakers are taking full advantage of the opportunities to voyage up and down this world-famous river. Its banks teem with historical places and buildings, all the way downstream from Windsor Castle to Greenwich, and its flooding tides bring ships of all types and many nationalities.

The trip downstream from Westminster Pier is as fascinating as the run upstream. Below Tower Bridge (*Continued on page 382*)





Britain's Largest Welding Manipulator

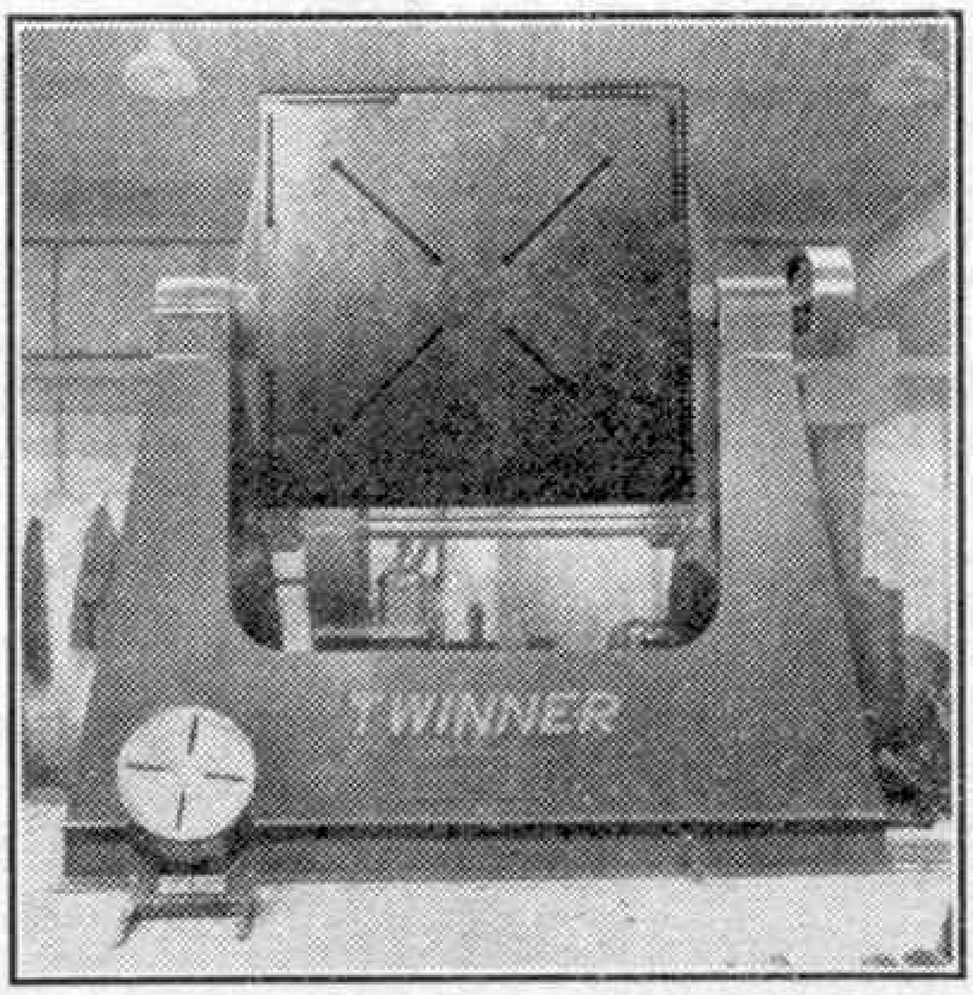
By Vivian J. Wyndham

IT is very rarely that fame in the heavy industrial world goes to a small town with a population of only 20,000 or so, which already has a staple industry. Yet this is what has happened to the picturesque moorland town of Leek, in North Staffordshire, a home of the silk industry that is situated amid the splendid rolling hills along the borders of the county with Cheshire and Derbyshire.

What has brought this about is the construction in the town of the largest welding manipulator ever made in Great Britain. This has been built by F. Bode and Son Ltd., and despatched by road to Sheffield, where it is now in use by Thomas Firth and John Brown Ltd., the famous steel firm.

Manipulators have become a necessity with the rapid development of welding practice. When small parts are being welded the problem of handling them may not be a difficult one to solve, but today parts of such sizes and weights are welded that special methods have had to be devised for dealing with them. The most successful is the introduction of the manipulator, of the type shown in the accompanying illustrations. In essence this is a large table to which the parts to be welded can be fixed. The table is mounted so that it can be turned to any angle required to allow the actual welding to be done easily and swiftly. A crane is not needed except for placing the work in position on the table and removing it when the job is completed. The saving in time may be as much as 30 per cent of that required if no manipulator is used.

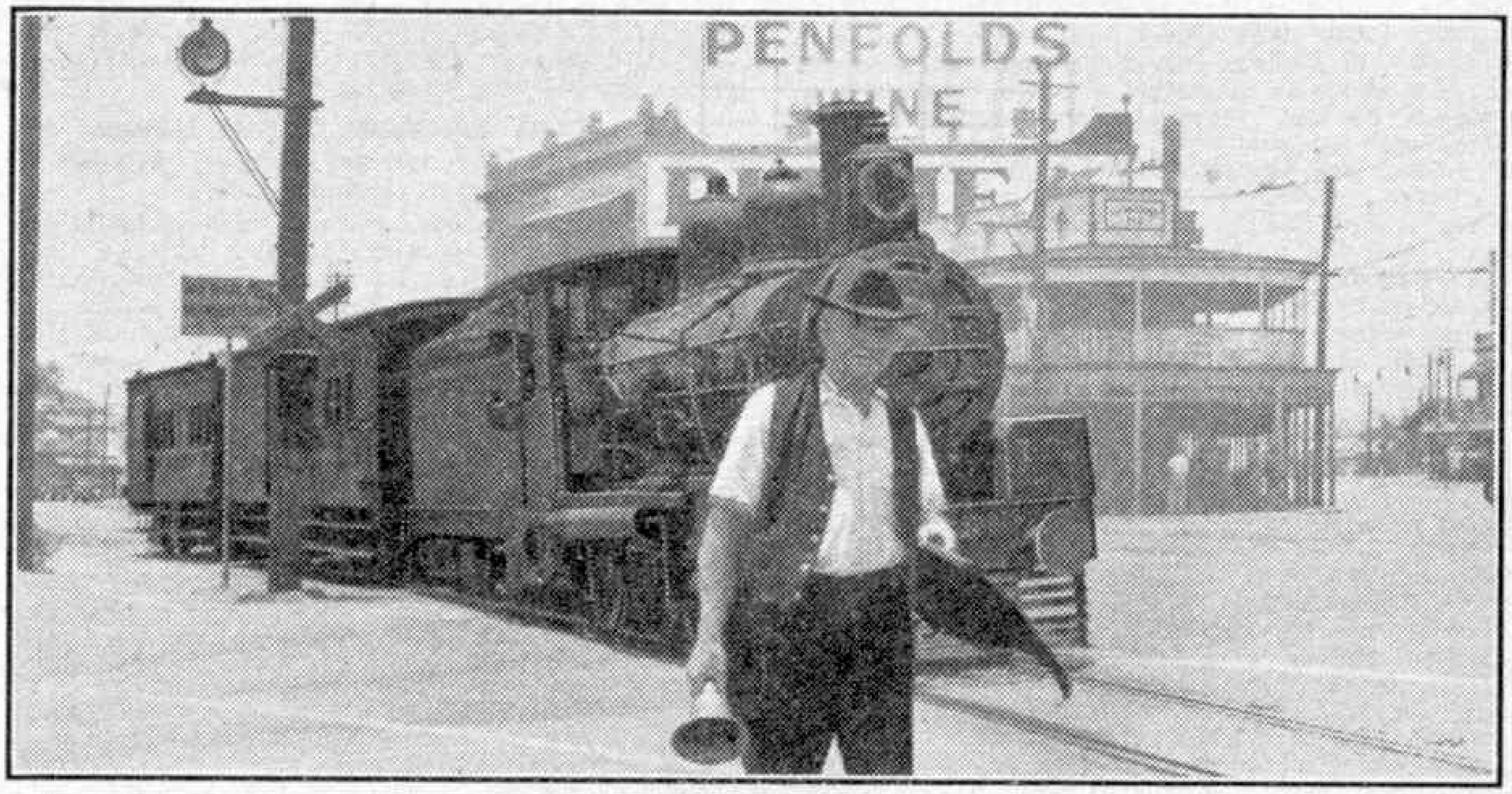
The Bode manipulator is truly a giant as can be realised from our upper illustration, which shows it mounted in position on its trailer, ready to be taken to Sheffield by road. It has been built to handle parts weighing up to 75 tons and having a length of as much as 40 ft. The manipulator itself weighs 37 tons and is 14 ft. long and 14½ ft. wide, with a height of 11 ft. 8 in. Removing it from the shed in which it was built, where it is seen in the lower illustration on this page, and loading it on to the trailer was itself a major operation that took more than a day and a half to complete.



At the head of the page the largest welding manipulator ever built in Great Britain is seen leaving the works in Leek, Staffordshire, where it was made. Below this is a picture of the manipulator showing the work table in a vertical position. Photographs by J. G. Holt.

From Our Readers

This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.



A Queensland Railways train crossing a road at Wooloongabba, Brisbane, preceded by a man with a red flag and a bell. Photograph by A. J. Lowe, Brisbane.

THE QUEENSLAND RAILWAYS

Queensland is about 7½ times as big as the United Kingdom, but the population is only 1½ millions. The task of providing road and rail facilities for the small number of those who wish to travel falls on the Government. The Queensland Government Railways were started in 1863, and now have about 6,650 miles of track laid. The rolling stock includes 820 locomotives, 2,400 carriages and about 21,000 trucks or wagons. Much of this stock, including locomotives, is made at Ipswich, 26 miles from Brisbane.

A feature that surprises many visitors is that the gauge is only 3 ft. 6 in. This results in capital economy, but limits speeds, and provides the basis for the facetious title "Queensland Miniature Railway."

Most stations in the bush have the very barest facilities, if any at all. Wonglepong station, less than 50 miles from Brisbane, handles two trains a week. Some stations boast only a name board, but Wonglepong also has a waiting room—a little tin shed! The occupant of a nearby house, in fact the only house within miles, acts as a general factotum when a train is due.

Most of the level crossings have no gates. A danger sign a few yards down the roads, maybe the wreckage of the last car that failed to beat the train, may constitute the only warning to users. To this Brisbane is an exception. At a busy crossroad at Wooloongabba, not far from the heart of this capital city, there is a much used goods line that runs from the main line station, through the wharves and goods yards, and on to the suburban line. There each of 80 trains a day is preceded by a man carrying a red flag and ringing a bell, as shown in the accompanying illustration.

A. J. Lowe (Brisbane).

St. Abbs Lighthouse, on the coast of Berwickshire. Photograph by W. A. K. Edmonds, Fakenham.

THE ST. ABBS LIGHTHOUSE

I wonder how many *M.M.* readers have seen this lighthouse. It is situated on the sharply rising Berwickshire coast. The lighthouse itself is placed on St. Abbs Head, on the very edge of the cliff, which rises over 200 ft. above sea level.

In its construction I think the lighthouse must be unique. Contrary to the generally accepted view that a lighthouse must be a towering colossus of stone, resembling the Wolf Rock lighthouse, the actual building at St. Abbs is less than 30 ft. high.

The five steel tanks seen on the left of the illustration of the lighthouse on this page are full of compressed air for the fog-horn. The steps in the foreground lead downward from the keeper's house.

The lighthouse is about three miles from the actual village which now supports three small fishing smacks, and a miscellaneous collection of even smaller craft.

W. A. K. Edmonds (Fakenham).

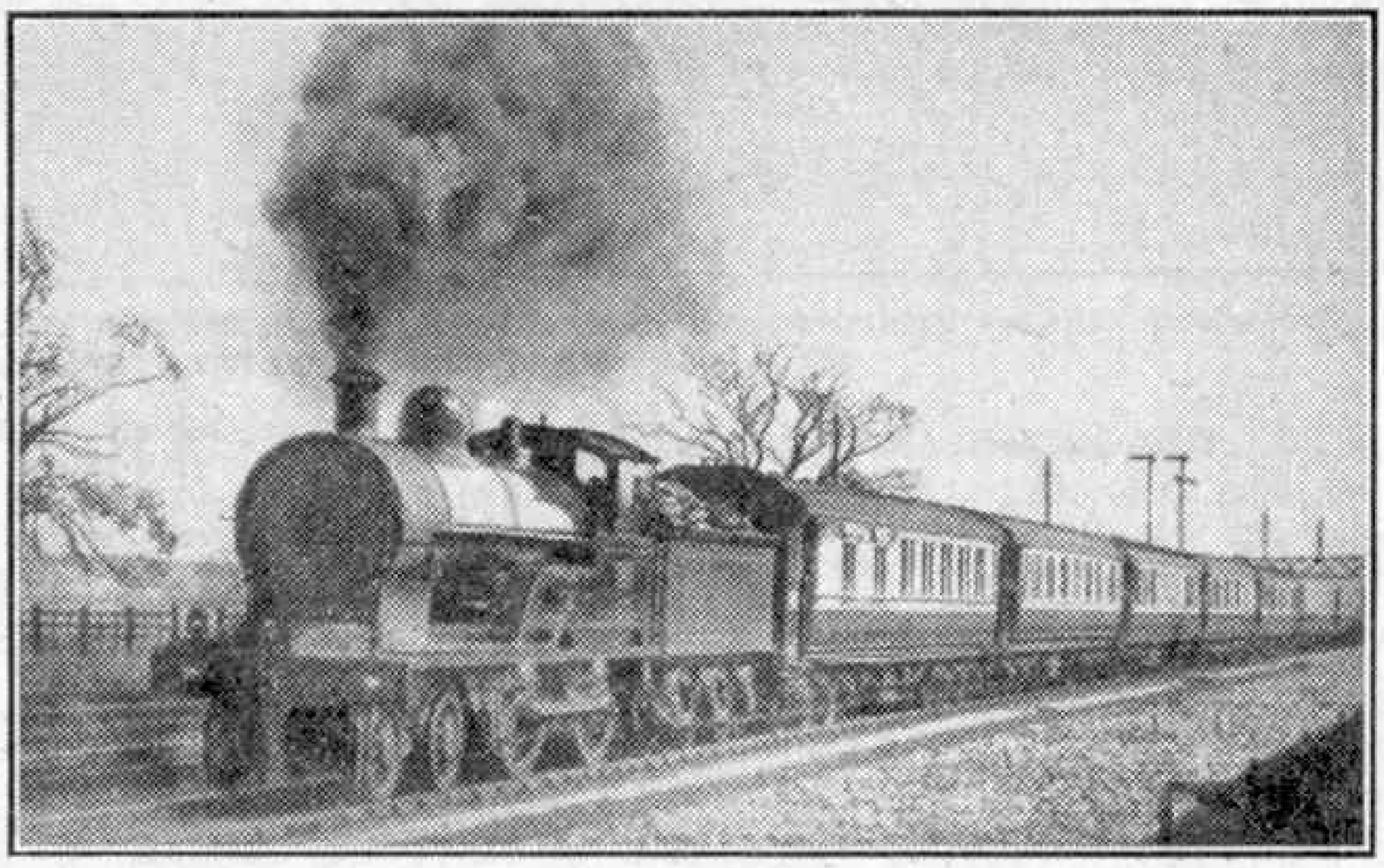
BOOKS TO READ

Here we review books of interest and of use to readers of the "M.M." With certain exceptions which will be indicated, these should be ordered through a bookseller.

"THE ZOO STORY"

By L. R. Brightwell (Museum Press. 16/- net.)

There is no place like a zoo, whether this be a local one, of perhaps only small importance, or the one that above all others has acquired the distinction of being "The Zoo," the great establishment in Regent's Park, with its wonderful extension at Whipsnade. It is with the London Zoo that Mr. Brightwell is concerned. Already many books have been written about it, but few as attractive and interesting as this. In it the author travels down the years that have passed since interest in animal gardens was stirred up by Sir Stamford Raffles, the great Empire builder whose chief monument today, apart from the Zoo itself, is Singapore. Raffles could scarcely have foreseen that his ideal would in no short time become more than an odd showplace where human beings could inspect other living creatures from all parts of the world. But that is what has happened, for it became the mother of several hundred zoos that today ring the world, and a pioneer in almost every activity in which animals are concerned.



Mr. Brightwell has not set out to give his readers a detailed history of official events, or to provide them with a wide range of zoological knowledge. Instead he has approached the subject from a human point of view, and has produced a fascinating story spiced with anecdotes and sketches. We read about the many famous Zoo inhabitants, among them Jumbo, the famous elephant whose sale to Barnum and departure to the United States provoked almost a riot, and Obaysch, the Zoo's first hippopotamus, who once broke loose and took possession of the gardens and was only captured by offering him as a bait a keeper whom he hated and whom he chased into his own enclosure. The keeper indeed was Jumbo's attendant, who only won his race by a short head, scrambling over the fence at the far side of the enclosure as the furious beast charged down upon him.

There are also stories of famous Zoo officials, including Bartlett, originally an animal dealer, who reigned as Superintendent for many years and completely reshaped the gardens, and Sir Peter Chalmers Mitchell, long Secretary of the Zoological Society, who was responsible for the creation of the great animal park at Whipsnade, where creatures of all kinds can be seen in almost natural surroundings.

Among the many splendid features of the Zoo that are made evident in the book is the splendid treatment that the animals receive from their doctors and dentist. Bartlett showed the way in this respect, with some rather vigorous tooth extractions and lancings, one of the former performed on Obaysch, and today treatment has been brought to a fine art. Many of the scientists and doctors associated with the Zoo appear to have been characters themselves, particularly Frank Buckland, who experimented on himself with many queer animal foods, and Dr. Plimmer, who dressed like a traditional anarchist and had his enormous shock of black hair trimmed once a year.

Space does not allow for reference to more than a tithe of the fascinating details of this splendid book, in which all lovers of animals will revel. Not its least attractive feature is the wealth of sketches with which the author has brightened his story.

"MILITARY AIRCRAFT OF THE U.S.S.R."

By Charles W. Cain and Denys J. Voaden (Herbert Jenkins. 3/6)

There are no experts on Russia, and provided one approaches this book with that fact in mind there should be no grounds for disappointment. Charles Cain and Denys Voaden have done a first-class job in sifting the confused scraps of information that have penetrated the Iron Curtain, and have compiled them into an attractive and useful reference handbook, with the assistance of Bjorn Karlstrom, a capable young Swedish artist.

Introductory notes on "Recognition Reasoning," Soviet Military Ranks and Insignia, and the Soviet and Satellite Air Forces are interesting and helpful; and the authors have avoided most of the unconfirmed aircraft which have decorated the pages of foreign air journals since the war, some of them almost certainly designed on this side of the Curtain. In general, only the MIG–15 cutaway, reputed twin-jet fighters and a sketch of two MIGs on hooks under the wings of a TU–4 need be regarded with caution. But recent jack-in-the-box acts by Communist jet fighter pilots in Korea indicate that the authors' deductions on such things as the non-fitting of ejector seats in Russian jets may not maintain the generally high standard of their book.

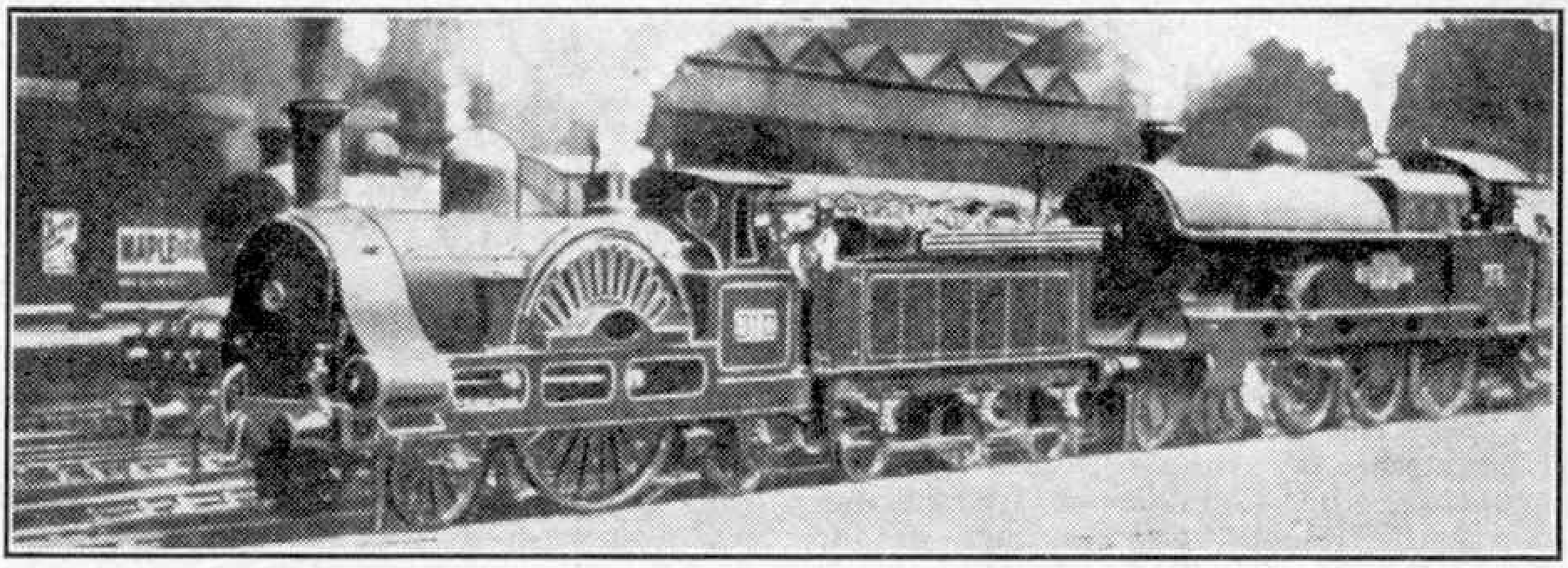
John W. R. Taylor.

"MATHEMATICS"

By E. T. Bell
(G. Bell and Sons Ltd. 21/-)

Professor Bell describes mathematics as the queen and servant of science. His book is not a history of mathematics, but is a stimulating selection from a huge field that will help to give amateurs enough of the spirit of modern mathematics to make them want to learn more.

The book introduces many strange and fascinating developments, with stories of the famous mathematicians responsible for them.



In the illustration opposite No. 2271 J. P. Bickersteth is seen near Kenton with the 2.0 p.m. from Euston, photographed by C. Laundy. Above the Cornwall is shown leaving Euston as pilot to Patriot on the 1.15 p.m. down Corridor in 1920. These illustrations are from "The Premier Line," by O. S. Nock, reviewed on this page.

"THE PREMIER LINE"

By O. S. Nock, B.Sc.Eng., M.I.C.E., M.I.Mech.E.
(Ian Allan. 25/-)

However one may view the claim of the former London and North Western Railway to be the "Premier Line," in many ways a justified boast, there is no doubt that the history of its locomotives makes a fascinating story. The principal L.N.W.R. passenger engines no longer exist, but many of the familiar Crewe eight-coupled goods engines survive today and they are still recognisably "North Western."

It would be easy in a book of this kind for a writer to display a certain amount of bias, but Mr. Nock skilfully avoids this. He begins with a brief run over the history of the L.N.W.R. and a description of its main line in order to give the reader a better understanding of the conditions to be faced by its locomotive organisation. The company was the product of amalgamation, so for a considerable time it boasted separate main divisions, each with its own Locomotive Superintendent and works. This involved differences and rivalries, admirably dealt with in the stories of the work of Allan and Trevithick at Crewe, and of McConnell at Wolverton. Unified control was eventually established at Crewe in 1862 under Ramsbottom, a great locomotive engineer, whose contributions to locomotive progress included water troughs and pick-up apparatus, the split piston ring and a particular design of safety valve.

Then we come to the long Webb era, with its Jumbos, Cauliflowers and Compounds. Mr. Nock gives a comprehensive account of this period, and of the activities of the very autocratic designer of these famous locomotives, and he is fair and accurate in his comments on their characteristics. Full justice is done to Webb's successor, George Whale, a man of remarkable skill and experience who completely reformed L.N.W. locomotive work, and to C. J. Bowen Cooke, the last of the Premier Line's Chief Mechanical Engineers, for soon after him came the grouping that merged the L.N.W.R. in the L.M.S.

Throughout Mr. Nock's story is that of an understanding enthusiast. His book is no mere recital of locomotive development class by class, but a living account of performances both on specially observed runs, and in ordinary service. Features of design and running results are critically analysed, but all the time in a most entertaining manner, and we are left with the conclusion that the Crewe engines that were dealt with so harshly under L.M.S. locomotive policy were not as black as they have often been described. They certainly had an amazing capacity for hard work, and all interested in the story of the locomotive will enjoy the author's account of them and the many excellent illustrations, mostly showing them actually at work. The illustrations indeed, two of which are reproduced on these pages, form with their index a fine pictorial record of the Premier Line.

"MODEL SAILING CRAFT"

By W. J. Daniels and H. B. Tucker
(Chapman and Hall. £3/3/-)

One of the many charms of model yachts as a hobby is that the hobbyist, having had the creative enjoyment of building the model can get many years' further enjoyment out of sailing it. Messrs. Daniels and Tucker are among the world's leading men in the building and racing of model sailing yachts, so that it is natural that this beautifully-produced book, now in its third edition, is devoted primarily to the really scientific models for national and international racing. But it is so clearly written, with lucid explanations and innumerable plans and sketches, that it can be of great assistance to the tyro who does not aspire to the beautiful model costing a large sum, but would like to build something that could beat the other models on the local pond.

Any number of the hints given will be as helpful to the youngster carefully making his first model as to the man who has been making and sailing class models for years. The theory of different points of sailing and the cut and trim of the sails will make all the difference to the success of quite a rough model made by an amateur, while anybody with a taste for applied mechanics will find the chapter on the steering gear, both the Braine type—which might well be spelt without the final "e" from the uncanny manner in which it will handle a model as though a helmsman were on board—and the newer Vane gear, fascinatingly interesting.

The production of the book is excellent and at the end the Glossary and Index are carefully compiled for their purpose.

Frank C. Bowen.

"BRITISH AIRCRAFT TO SCALE"

(Iliffe. 1/6)

This booklet contains plan-view drawings of 85 different British civil, Service and research aircraft, most of which have already appeared in "*Flight*," the well-known aviation weekly. The drawings were prepared with the dual object of providing a comparison in size and stimulating interest in the art of aircraft recognition.

Some of the comparisons in size are very interesting. It is surprising, for instance, to learn that the 52,500 lb. twin-engined Airspeed Ambassador has a greater wing span than the 86,000 lb. four-engined Handley Page Hermes IV. There are also tables of technical data of current British aircraft.

The Sligo, Leitrim and Northern Counties Railway

By C. L. Fry

THE Sligo, Leitrim and Northern Counties Railway, generally known as the Sligo Leitrim, has the unusual distinction of running through two countries—the Republic of Ireland and Northern Ireland. On one side of the border it connects with the Great Northern Railway (Ireland) at Enniskillen, and on the other with Coras Iompair Eireann at Sligo. On its way from Sligo, in the Republic, it passes through Ballysodare, Collooney, Dromchair, Manorhamilton and Glenfara before crossing the dividing line to Bellcoo, Florencecourt and Enniskillen in Northern Ireland, a distance of 49 miles.

The Sligo Leitrim is built to the standard Irish gauge, 5 ft. 3 in., and is one of the few railways in these Islands to maintain its original name since it was opened, in 1882. It has no branch lines.

The Company uses the former Midland Great Western, now C.I.E., station at Sligo as its terminus, and has running rights over C.I.E. from there to Carrignagat Junction where the S.L.N.C. system proper starts. A rather interesting feature of the line is that although there is a double line between Sligo and Carrignagat Junction, C.I.E. trains use what should be the down main line in both directions and the S.L.N.C. trains use the up main line in both directions. Thus in actual fact there are two single main lines running side by side for this distance and at the intermediate station Ballysodare there is a double crossover.

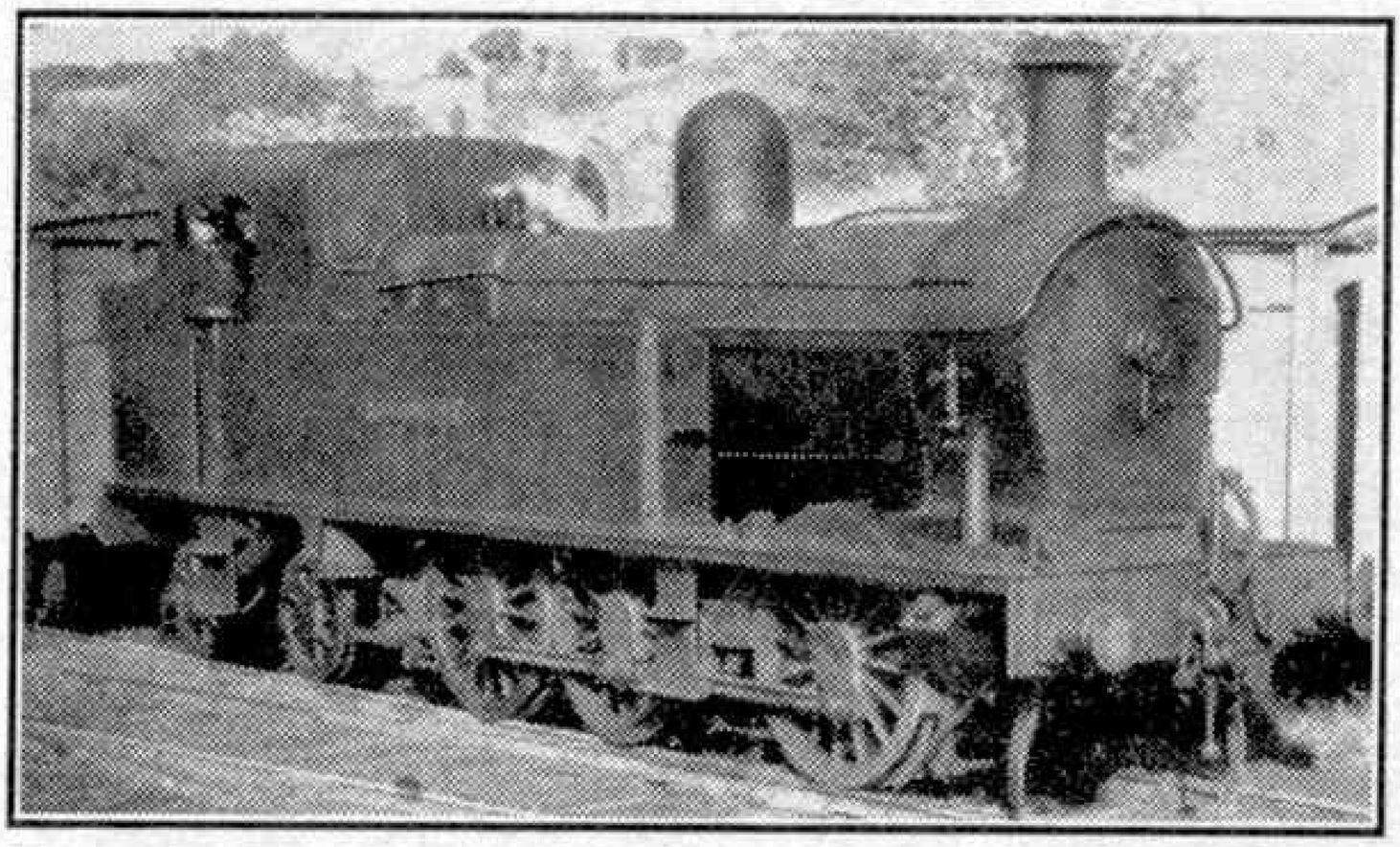
From Carrignagat Junction the line runs through country that gradually becomes more and more rugged in character as it winds its way between the hills and mountains of the Border districts. The line must surely be the crookedest standard gauge railway in the world. I do not think that anywhere there is more than half a mile of it straight. In addition, the gradients are very severe, some of them as steep as 1 in 50, and the curves very sharp, a number of them being only of 12 chains radius, so that a driver must be accustomed to this line to get along at all. When climbing a hill the gauge glasses may show the locomotive boiler full of water, but when the engine goes over the crown the water can almost disappear out of sight in the glasses, giving the impression that the boiler is empty!

Manorhamilton Station, on the Sligo, Leitrim and Northern Counties Railway, is among the Leitrim Hills. The workshops of the Company are at this station.

The largest bridge on the system is the Killyhevlin Bridge, spanning the River Erne, a very fine structure of latticed iron girders. This is 467 ft. 6 in. long and has eight spans, the three longest being 75 ft. each. The longest single-span girder bridge on the line is that over the MacNean River. This is known as the Border Bridge, for this river is actually the border line between the Republic of Ireland and Northern Ireland.

The original rails laid were 60 lb. per yard, in 30 ft. lengths, but today they are 75 lb. per yard in 45 ft. lengths. This light track limits the axle loading, a severe handicap on the type of locomotive

used. All the engines at present are 0–6–4 "long-boiler" tanks, built by Beyer-Peacock and Co. Ltd. They have names, but no numbers. The earlier Sligo Leitrim 0–6–4 engines were *Leitrim* and *Fermanagh*, built in 1882, *Lurganboy*



"Lough Erne" one of the two latest locomotives, follows the S.L.N.C. traditional 0-6-4 "long-boiler" type, as is evident from this photograph.

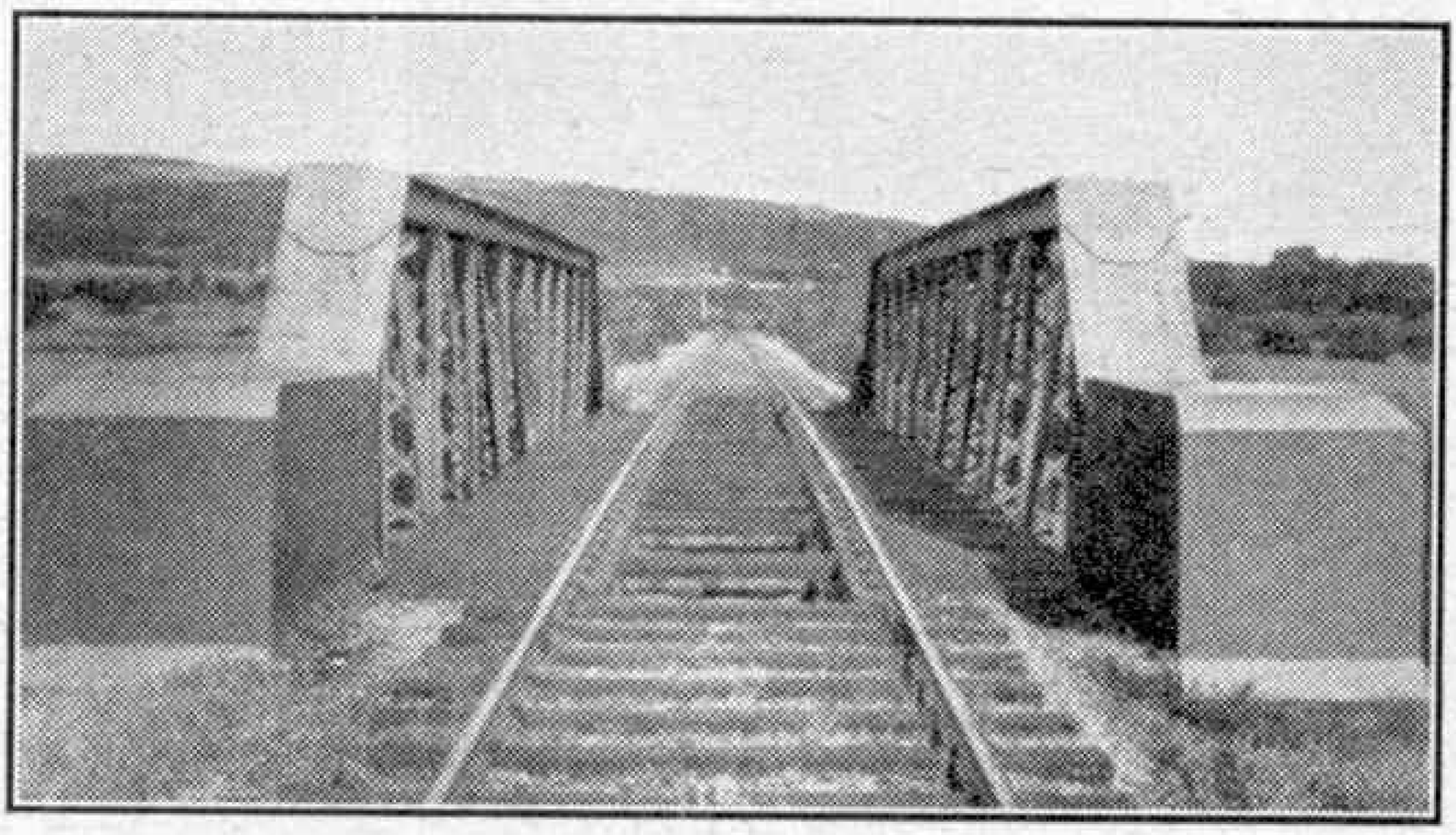
in 1895, and *Lissadell* and *Hazelwood* in 1899. They had cylinders 16 in. by 20 in. and driving wheels 4 ft. 9 in., and they weighed 27½ tons. One of this class is still operating. The next three engines with this wheel arrangement were considerably larger. These were *Sir Henry*, built in 1904, *Enniskillen* in 1905 and *Lough Gill* in 1917. Their cylinders were 17 in. by 24 in., their driving wheels were 4 ft. 8 in. and their weight 52½ tons.

The two latest locomotives *Lough Melvin* and *Lough Erne* were delivered in 1951. They are similar to the *Sir Henry* class with only slight alterations. The cylinder diameter has been increased to 18 in. and the appearance is more modern as a result of the rounding of the edges of the cab roof and the reduction in height of the chimney and the dome by a few inches. Originally all engines were painted olive green and lined in red, but now they are all painted black without lining.

The Sligo Leitrim owns three tri-composite bogie coaches, for second class travel was only abolished last year. Then there are two composites, five third class coaches and two third brakes. With the exception of the five third class six-wheelers, all coaches are steam heated and most of them have electric light. The coaches are painted maroon, but are not lined out. There are 198 wagons, 1 horsebox and two carriage trucks.

Railcars, too, play a part in the running of this remarkable railway. The original vehicles of this kind are two railbuses, which were formerly G.N.R.(I) road buses. They were fitted with new Gardner diesel engines and new bodies were built for them by the G.N.R. at Dundalk. They have Howden-Meredith patent pneumatic wheels, which have a special inflated tyre and tube inserted between the wheel tyre and boss. Both these cars haul luggage trailers of specially light build. In 1947 a very fine modern articulated railcar was purchased from Walker Bros., Wigan. The driver's cab and the engine unit are articulated to the car body, and the power bogie has four-coupled wheels with outside rods.

Mr. G. F. Egan, Chief Engineer of the system, looks after both the mechanical and civil engineering of the line. Considering the meagre resources at his command, not only mechanically, but also financially, the entire system does him great credit.



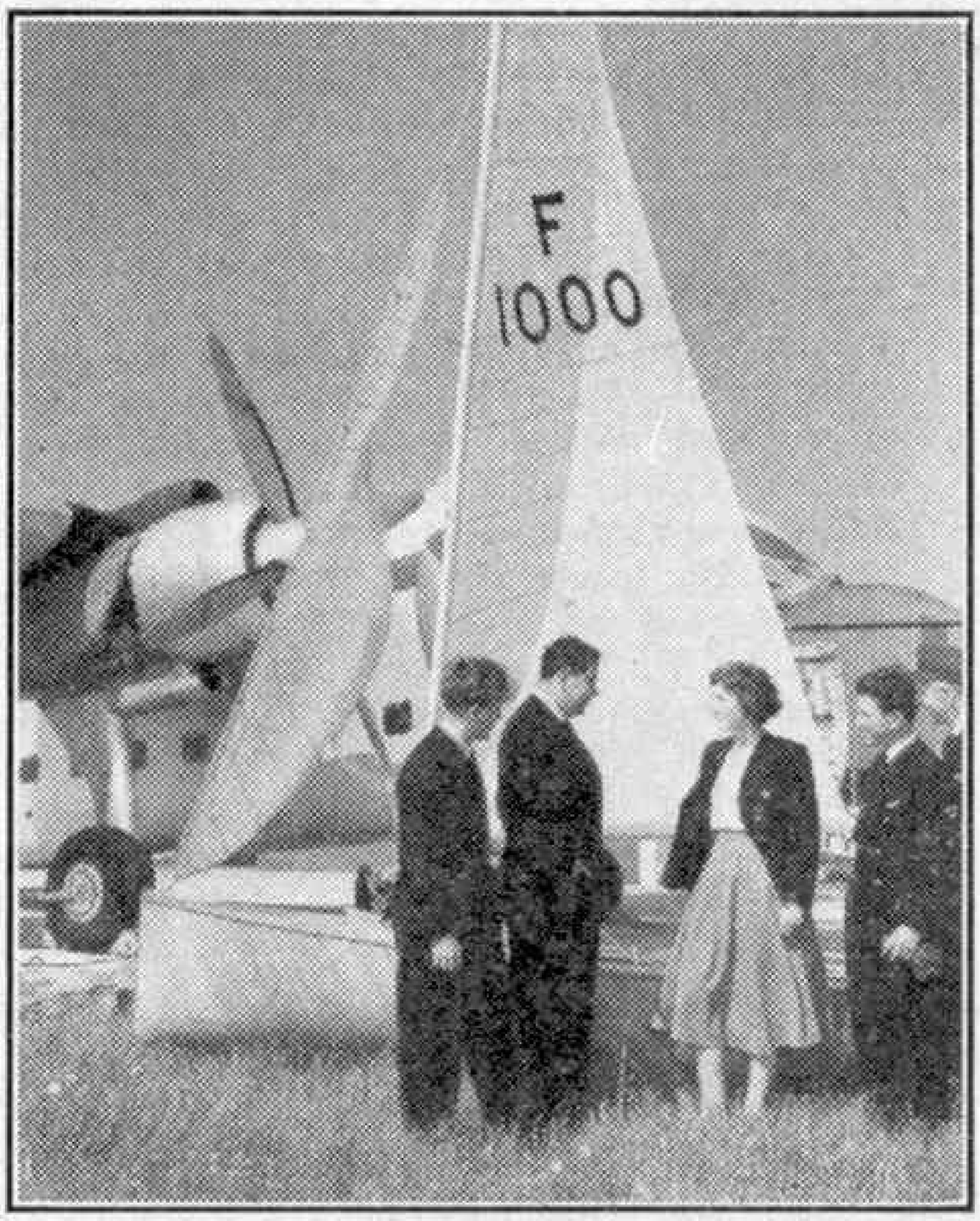
Border Bridge, over the MacNean River, is the longest single-span girder bridge on the line.

Sails in the Sky

By John W. R. Taylor

HAVE you ever been from Southampton to Cherbourg and back with a boat in less than two hours? I have! But before you start measuring distances on your atlas, and discover that our boat averaged about 150 m.p.h., I had better explain that on this trip the boat, its towing trailer, the motor car to tow it, the young lady to sail the boat, myself and ten other people all flew in one of Silver City Airways' Bristol Freighter aircraft.

It all started when the owner of a small sailing dinghy, who lives in Southampton, heard that Silver City were considering



The 1,000th Fairey Firefly dinghy, with Jennifer Alexander, its 19-yr.-old helmswoman, talking to Capt. Hackett, who piloted the Freighter aircraft on the cross-Channel flight described in this article. Photograph by courtesy of the Bristol Aeroplane Co. Ltd.

an air ferry service between Eastleigh (Southampton) Airport and the Isle of Wight. He had often raced against other helmsmen at Cowes and Ryde, and realised that the proposed air ferry would enable him to fly his boat over to the Isle of Wight on its trailer, have a day's sailing against local clubs and return home the same day in comfort and at reasonable cost. Other small boat enthusiasts had the same idea at about the same time; so Silver City decided to make an experimental cross-Channel flight carrying a dinghy, to prove that the idea was practicable.

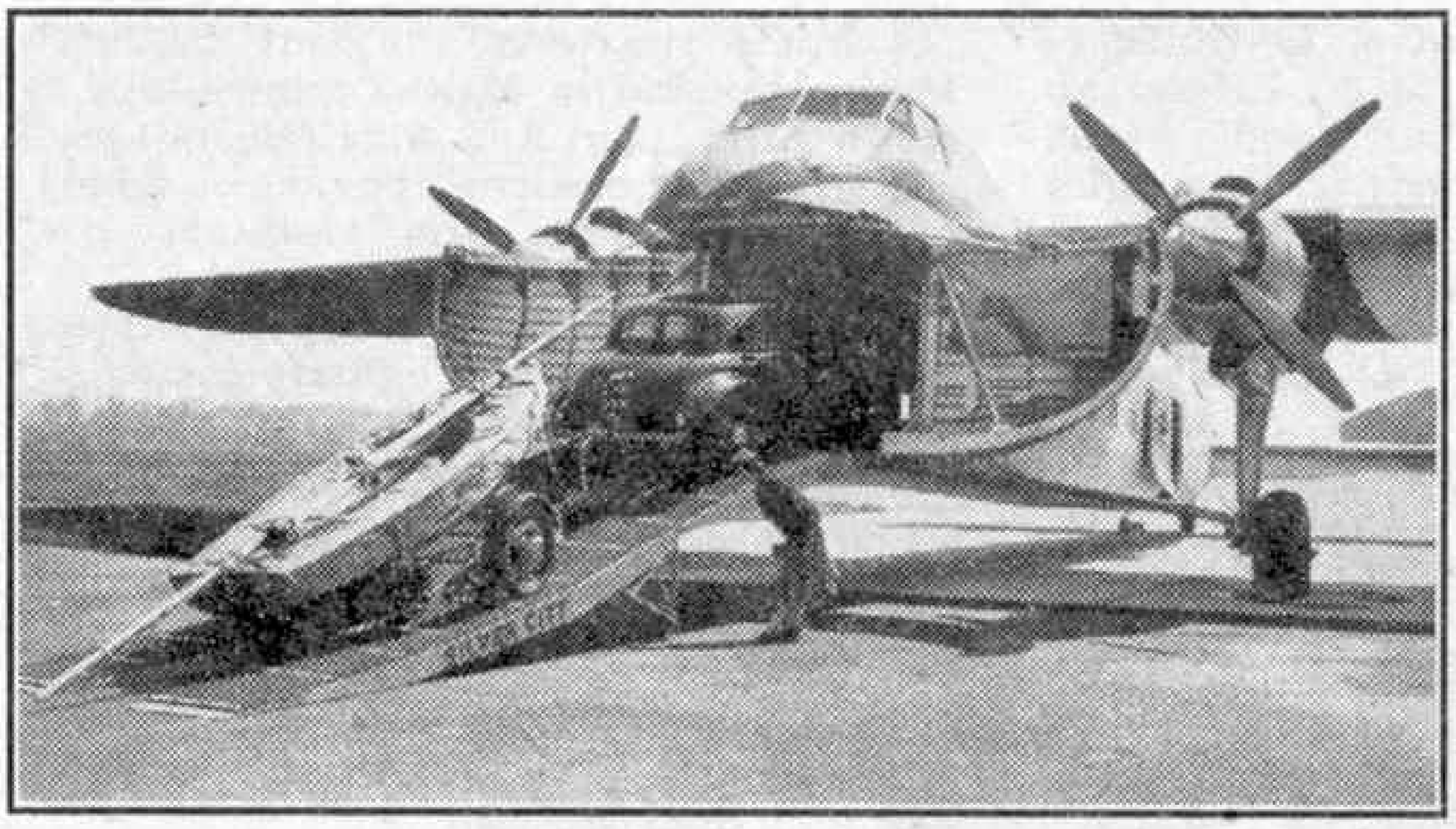
They gave the whole experiment an aeronautical flavour by asking The Fairey Aviation Company if they knew anyone who wanted a boat delivered to the Continent in double quick time. This was not so odd as it sounds, because Fairey's have a subsidiary company at Hamble, near Southampton, called Fairey Marine, who specialise in making small fast sailing dinghies. These boats carry the names of famous Fairey naval aircraft, including *Gannet*, *Firefly* and *Swordfish*, and are built of moulded mahogany ply, in the same way as wartime Mosquito bombers. They are easy and comparatively cheap to produce, but have better finish and performance than anything else in their class anywhere in the world. As a result, they have achieved tremendous worldwide popularity, and the boat chosen for the experiment was actually the 1,000th Firefly built by Fairey Marine in five years—a record production of one class by any small boat builder.

Another reason for choosing a Firefly was that when mounted on a trailer it measures only 15 ft. long, 6 ft. 6 in. wide and 4 ft. 9 in. high, not counting its mast which can be detached and stowed wherever convenient. It is thus about the same size as a normal 12 h.p. motor car, and can be carried across the Channel on Silver City's Southampton-Cherbourg service for the same fare of £15. On the shorter Lympne-Le Touquet route, the fare is even cheaper, at £12.

Details of the trip were quickly settled, and on Friday 16th May I found myself at Eastleigh Airport with the 1,000th Firefly, popularly known as *Nono* (a thousand times no), a small party of other Press representatives and 19-year-old helmswoman Jennifer Alexander, who was to take the dinghy to Cherbourg. It was a beautiful day, and we felt very happy at being able to take part in a historic experiment—the first time that a boat, a car and an aeroplane had ever flown together in one

unit. The fact that our objective was so near to the historic Normandy invasion beaches made us feel almost like invaders ourselves; but our expedition was bent on pleasure, not war.

As far as I was concerned, the first part of the proceedings, after passing through Customs, was an honour but a rather dubious pleasure. The Firefly, neatly stowed on its trailer, was fastened to the towbar of the car, and I was informed that I could drive the whole assembly up the special ramps into the Freighter's cargo-hold—something which no journalist had ever before been allowed to do. I drove the car and trailer round in a wide circle on the concrete aerodrome apron, and lined up the Morris's nose with the centre of the gap between the Freighter's big nose-doors.



The Firefly being hauled up the ramps into the roomy hold of the Freighter.

I then proved the law of perspective all wrong, because the nearer the car got to those two tapering ramps the narrower they seemed to get. But Capt. Hackett, Silver City's Southampton manager, waved me on from inside the aircraft, so I drove up the ramps, feeling quite sure that at any moment I would run off the edge. To make matters worse, the photographers asked me to stop half-way up, while they took pictures, and then to reverse the car and trailer down again before finally driving it into the aircraft. My one consolation is that the photographs, taken from behind, will not show whether I had my eyes shut!

After that, the rest of the journey was a sheer delight. We made an incredibly quick take-off from the grass airfield and were soon looking down on the famous Southampton docks, swarming with craft of all sizes and with Aquila Airways' Solent flying boat gleaming silver at the late-lamented B.O.A.C. Berth 50, ready for 11 p.m. take-off for Madeira. On we flew, past the Solent River, over the Isle of Wight at about 1,000 ft.; and, as we left behind its brilliant white cliffs, Capt. Hackett brought the big Freighter down to within 50 ft. of the calm sea, for our especial benefit, skimming along as smoothly and sweetly as when, during the war, he used to bring home his Coastal Command Liberator bomber over that same sea after hunting for enemy submarines.

Once or twice we encountered ships, and cameras clicked as we flashed by, well below the tops of their masts. It was superb flying, although one passenger, seeing the nearness of the water, could not resist expressing a fervent hope that Capt. Hackett did not think he was in the Firefly.

As we approached the French coast, the Freighter returned to about 1,000 ft. We banked over the great stone monument that commemorates the liberation of Cherbourg in 1944, and, as the aircraft's wing flaps slowly (*Continued on page 382*)

This view of the aircraft with its nose-doors closed gives a good idea of the great width and depth of the cargo-hold. Photograph by R. Knight, Winchester.

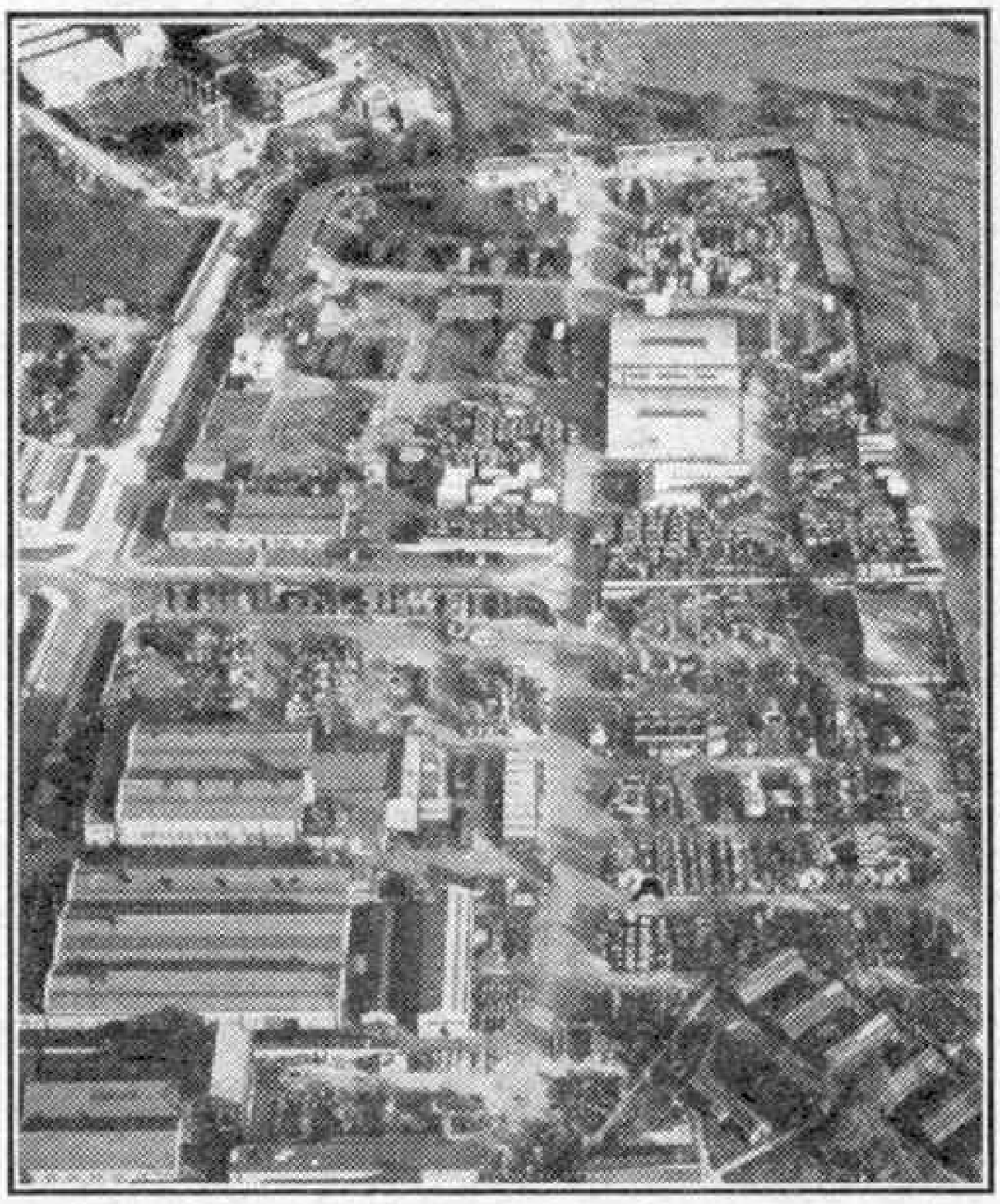
Big Building

Modern Construction on a Gigantic Scale

By W. H. Owens

THERE is always work for builders and civil engineers to do. They can conquer natural forces, and plant civilisation in remote areas of the world. They create new towns and cities, new sources of wealth and prosperity, and provide happier and healthier living conditions for millions of people. Few occupations indeed bring a keener sense of achievement coupled with adventure.

We live in an age of tremendous building development and in recent years, despite material shortages and other restrictions, this has been carried on in great variety all over Britain. Apart from the urgent need for houses, there has been a demand everywhere for new schools and hospitals, factories, power stations, aerodromes, roads, bridges and public works of all kinds. It will be realised that our building industry is likely to remain very active indeed for many years to come.



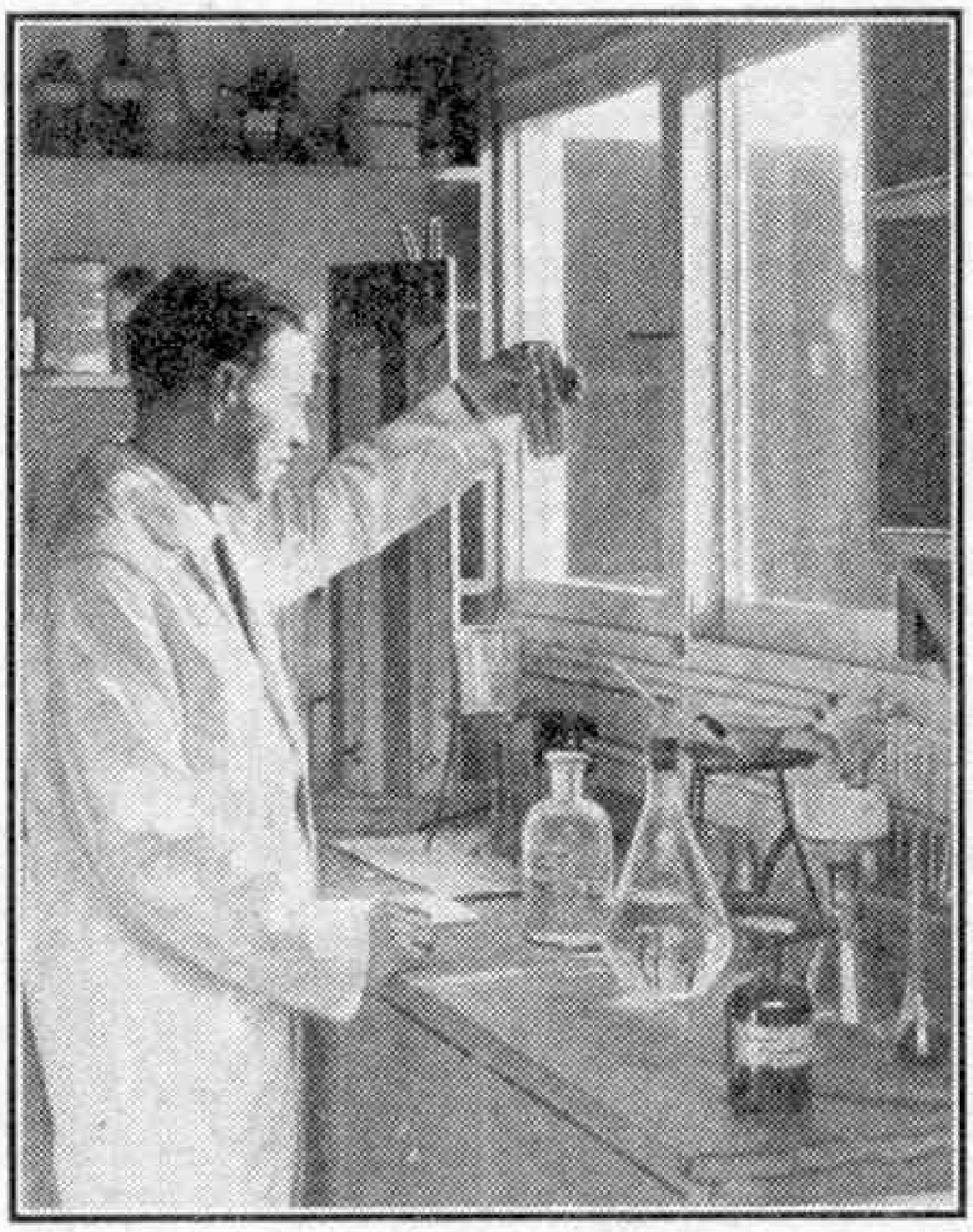
The plant department of a large building firm, John Laing and Son Ltd., to whom we are indebted for the illustrations to this article.

Behind each and every one of these new building projects is a romantic story—a story of gigantic organisation and meticulous planning, of marvellous machine power, scientific research and human teamwork. To find out about it I visited John Laing & Sons Ltd., one of the largest firms of building and engineering contractors in the Empire, who are engaged on contracts widely scattered up and down Great Britain and overseas as well. Laing's build anything from aerodrome runaways to giant factories, from a hospital in Malta to townships in South Africa, and to a wide range of civil engineering operations they have added, in the last ten years, opencast coal mining.

Every big building or engineering contract is rather like a military campaign, which begins immediately the tender for the job has been accepted. All departments of the firm go into action to a pre-arranged programme which covers materials, transport, machinery, personnel and welfare. Within a matter of hours materials are on order for specified dates, machines and vehicles are earmarked and perhaps on the move, while essential staff with mobile office and caravans if necessary are on their way to the site.

Anything up to 800 or 1,000 men may be required for a contract once the work gets under way. Most of this labour will be recruited locally. But some of the sites are in lonely places, or the necessary labour may not be immediately available. Then the contractor has to provide his own transport service to take the men to and from their homes. In the case of a big factory contract at Darlington, Laing's were bringing at one time sixteen bus-loads of men daily from as far as Hartlepool and Bishop Auckland, a journey of some thirty miles.

To accommodate administrative staff



A chemist tests building materials in his laboratory.

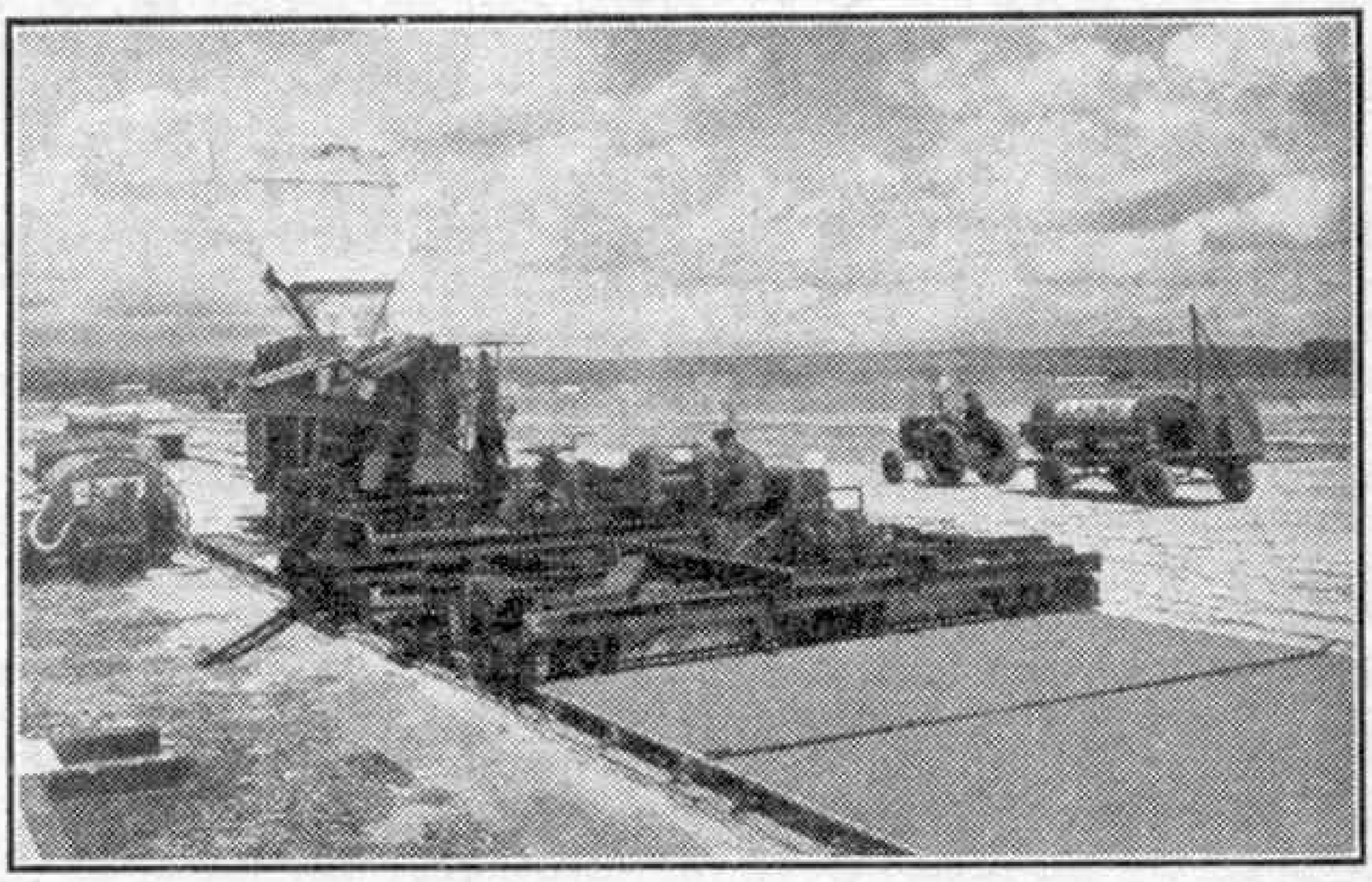
and key workers the firm have built their own fleet of mobile caravan homes, furnished and equipped for a site manager and his family or as a dormitory for six men. These men may have to live on the site in all weathers for months on end, but the caravans give them every comfort. One caravan equipped as an office ensures a speedy start to the job. Canteens are also set up, and other welfare facilities are provided in readiness for the great influx of workers as construction proceeds.

Mechanisation now plays a most important part in building construction, especially on big sites. Before the first steel girders are fixed or the first bricks laid, marvellous machinery goes into action clearing, levelling and draining the land and making temporary transport roads. Soon after the contractor's arrival, therefore, one may find a remarkable assembly of machines and plant—giant scraper-excavators, mobile cranes, trenchers for drains, walking draglines, pile drivers, compaction rollers and mammoth concrete mixers. On some sites the machinery and heavy plant involve a total cost of more than £100 *an hour* to operate.

New machines are constantly being developed to speed up operations. An example is the Koehring twinbatch mobile paver, which simultaneously mixes concrete and spreads it on new runways, factory road approaches and the like. This time-saving outfit lays 90 cu. yds. of concrete an hour. Paving for two airfield runways, equivalent to 12 miles of 20 ft. highway, was recently completed with the mobile paver in 58 working days with a team of 36 men. Thirty-six men and this machine do the work that would have required 20 smaller machines and 200 men a few years ago. The quality of the concrete is much better too.

Supporting the big machines are fleets of lorries and dump trucks. An amazing variety of vehicles is used, each adapted to its purpose—some to negotiate the roughest ground, some to carry heavy loads, and some to carry men. Lorries carrying materials to just one new building site somewhere in Britain covered the astonishing total of 8¼ million miles!

Machines and vehicles need constant care if they are to stand up to the heavy daily wear and tear outdoors. While there are maintenance engineers on every site, Laing's also have a central plant depot and repair shops at Elstree, in Hertfordshire. This large depot is responsible for the supply and maintenance of all machines, transport and non-mechanical plant used in construction and civil engineering operations, and there is a busy flow of



Concrete roads and runways can be laid down at the rate of 90 cubic yards an hour. The machine in the foreground of our illustration spreads and levels the concrete as it moves slowly forward.

traffic to and from the sites throughout Britain.

The Elstree shops, staffed by teams of engineers and electricians, are divided into a number of different sections—heavy plant, light plant, engine shop, machine shop, welding shop, transport repair shop, and so on. As each unit arrives at the depot it undergoes a thorough steam cleaning before going on to the appropriate shop. When the overhaul is complete, it passes through the paint shop before being checked out for delivery to the site. The contrast between the mud-spattered, tired-looking vehicles arriving and the gleaming, freshly-painted vehicles setting off for duty again is amazing.

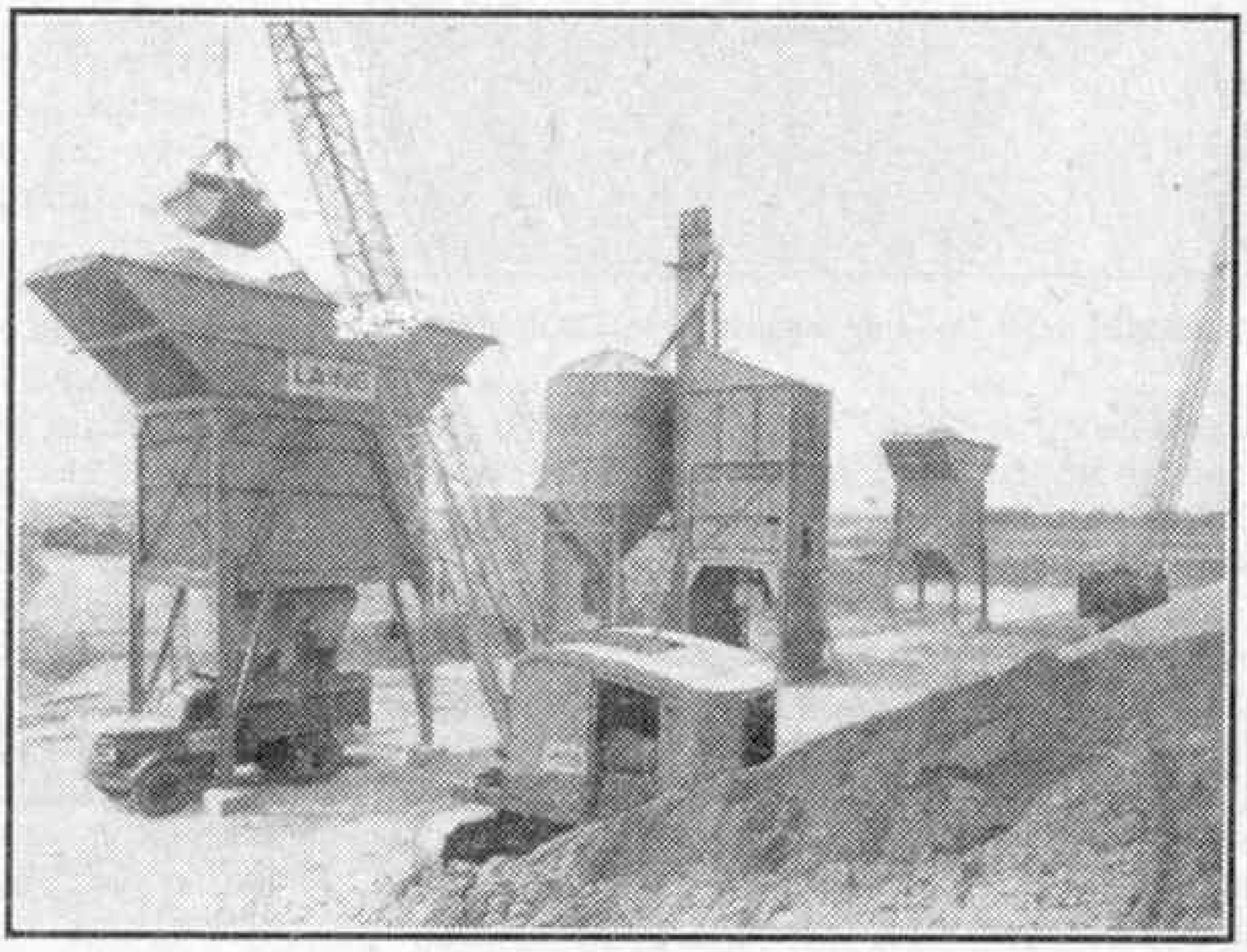
But between the cleaning bay and the paint shop, every unit is stripped right down, and engines and motors are sent for complete overhaul. When an engine is dismantled the parts are carefully labelled with metal tags and then put through a series of washing tanks. All heavy equipment is handled speedily and efficiently by overhead cranes. Then finally, each engine undergoes a performance test checked by instruments.

Any worn parts that are worth reclaiming are made good again in the machine shop. Here, too, special items of equipment designed by Laing's engineers are made, including small parts that may be wanted urgently and are not readily obtainable elsewhere.

Another part of the Elstree plant depot is given over to stores. No fewer than 45,000 different parts—running into hundreds of thousands of items—are kept in stock. By a simple card index system any single item can be found in a few minutes. In a special temperature-controlled warehouse are tyres of all sizes and pressures to fit a bewildering assortment of vehicles. Parts and supplies must be distributed all over the country with great speed, and in special cases may be sent to distant sites by aeroplane. Laing's have even flown a 'plane 3,000 miles across the Atlantic on occasions to get spare parts in a hurry for one of their American machines.

As building construction has become more mechanised in recent years, so has it become more scientific. When a new site is surveyed, for example, a soil analysis is carried out to determine what foundation pressure the subsoil will carry. From then on the scientist is consulted at every stage.

Laing's have a mobile laboratory on most big sites for dealing with day-to-day problems. But there is also a Central Laboratory at headquarters which investigates more complicated and more general problems. The scientists here are constantly experimenting with materials, developing new ones, finding out why some fail or how others can be used more efficiently. One of their post-war achievements was the development of a new, light-weight building material known as Thermalite. This is made in convenient slabs and, as an alternative for bricks, is helping to speed up and cut the costs of house building.



Central plant for weighing out batches of cement and aggregate for mixing into concrete.

But let us return to the site itself, where good progress is being made. As the work develops the labour force must expand and many types of specialist craftsmen are brought in—carpenters, tilers, plumbers, electricians, heating engineers, plasterers, joiners and painters. Materials pour in with increasing volume, yet steadily enough to avoid any bottlenecks or shortages which might throw the whole carefully timed schedule out of gear. But all this is taken care of by the Progress Department at headquarters.

Slowly the new buildings (Cont. on p. 382)

Photography

Getting Clouds in Pictures

By E. E. Steele

IT will be agreed that most landscape photographs are immensely improved if suitable clouds are shown in the sky, but many amateurs accept skies of even tone as inevitable, regarding the introduction of clouds as something beyond their skill. However, it is quite simple to get a good rendering of clouds when once the principle is understood. The films we use are very sensitive to the blue rays of light, so that our clouds are usually so hopelessly over-

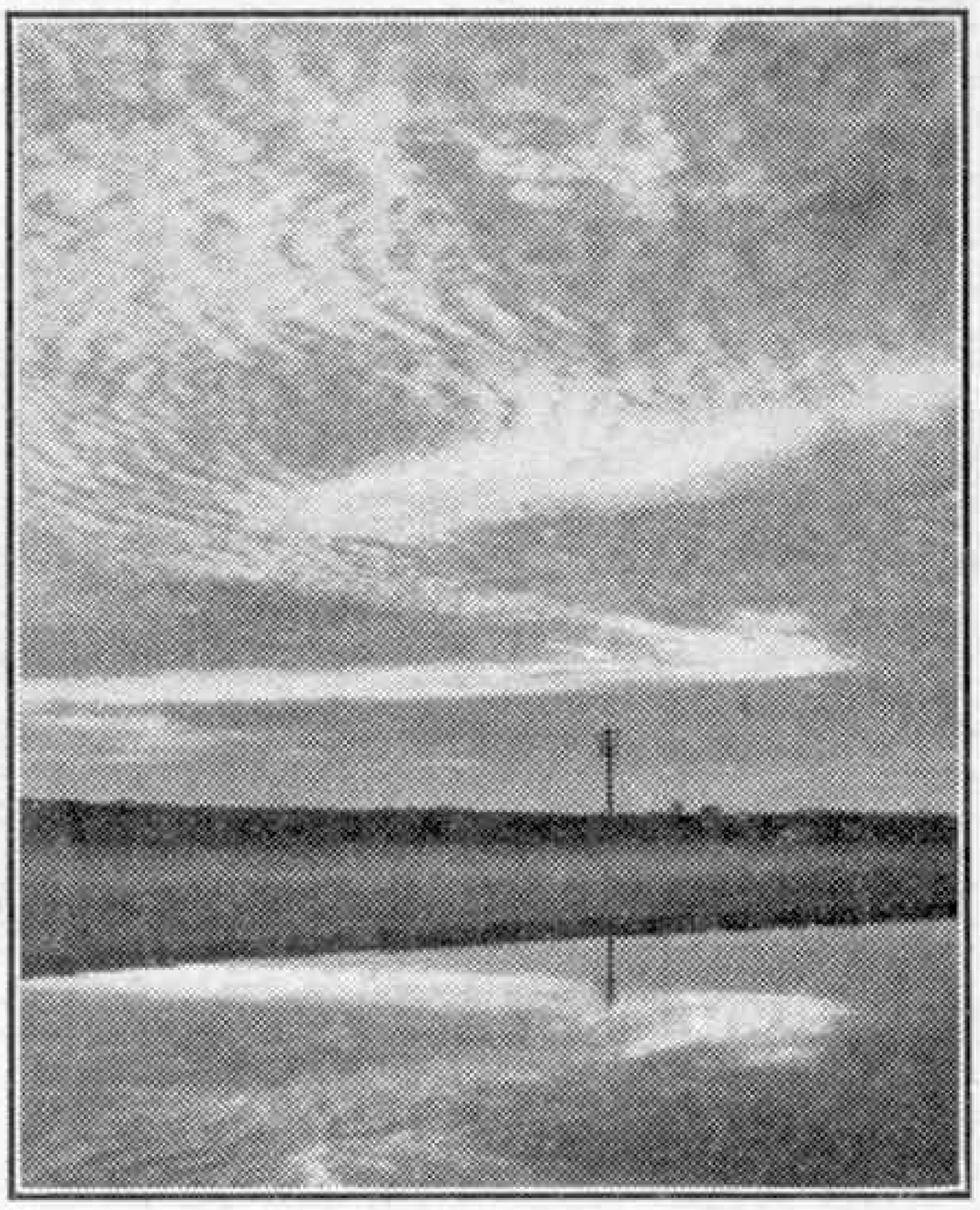
A storm brewing.

exposed in relation to the other subject matter that they fail to print out.

The best way to remedy this is to place an appropriate filter over the lens before making the exposure, in order to hold back, or filter out, some of the blue rays. This is best done with yellow filters in various depths of colour from pale yellow to orange, the deeper the colour the more contrast. Very unreal effects can be obtained by using deep orange or red filters, when clouds can be made to appear white against an almost black sky. Such effects are only needed for special occasions, and the amateur will be satisfied with a pale, and a medium yellow, filter when using orthochromatic films, and a green filter can be added for panchromatic films. This gives about the same effect with clouds, but allows rather better correction with the green tones of landscape.

It will be seen that the use of a filter, stopping some of the light, makes it necessary to give some extra exposure to the film. As a rough guide, with a pale yellow filter ortho film will require about double the exposure, while the medium filter may necessitate an increase of some four times. With pan films the increase will be about half the above.

These filters are usually made of dyed glass, and are supplied in mounts to fit most cameras, but excellent



Cloud reflections. The illustrations to this article are from photographs by the author.

results can be obtained from gelatine filters as supplied by such firms as Ilford and Kodak. These cost only a few pence per square inch, and can be placed in a home-made cardboard mount, but must not be finger marked or allowed to become damp. When not in use they can be conveniently kept in a pocket book.

Cloud formations are always interesting, and vary from the light clouds of settled weather to the heavy and fantastic patterns that are a feature of Summer thunderstorms. At sunset delightful effects can be seen as the rays pierce a cloudbank, forming downward shafts of light. Taking pictures of cloud forms can be a fascinating hobby, and the practice will greatly improve one's technique.

Where good cloud studies are especially required, and can be taken on one roll of film, it is wise to cut down development time by about 20 per cent. This will result in a rather soft negative, full of detail, which is ideal for delicate sky tones, so easily lost by over-development.

Rays from the Sun.

The up Flying Scotsman headed by A1 No. 60143 Sir Walter Scott passes from North Eastern to Eastern Region at Shaftholme Junction. Photograph by R. E. Vincent.

Railway Notes

By R. A. H. Weight

More Diesel and Steam Railcar Developments

In April last the first two twin-car diesel sets for main line work in Eire entered service on the Dublin-Waterford line, C.I.E. They are almost identical with those operating on the former G.N.R. (I) system, which we recently described. Several more are on order.

Experiments have been taking place with a new type of lightweight diesel-mechanical car which can be operated as one-, two-, or three-car trains, there being at present two motor vehicles and one trailer. Each motor car is powered by a six-cylinder diesel engine of the type used on the latest London Transport "Green Line" omnibuses, the engine being below floor level. Driving and control can be effected from either end by one man. There is electric lighting and automatic vacuum brake. Power is transmitted to the wheels through a fluid flywheel and four-speed epicyclic gearbox. Seating is provided for 129 passengers in three cars measuring 120 ft. 9 in. in overall length. The train weighs less than 40 tons, so that there is considerable economy in length and weight compared with normal railway coaches. The units are an adaptation for railway service of the latest road motor practice on outer London suburban or similar routes by the A.E.C. works, Southall, Middlesex, and Park Royal Vehicles Ltd.

Another development in the London area has been the introduction of two modernised and attractively upholstered steam railcars of the push-and-pull type on the Western Region Ealing-Greenford line, bearing the names *Thrush* and *Wren*. Other cars in this bright new style and named after British birds will be brought into service.

Some of the former G.W.R. diesel cars are smartly turned out in red and cream.

Western Tidings

Large pannier tanks continue to arrive from contractors' works including Nos. 9466–72 and 8476–82. The gas turbine locomotive built by the Metropolitan-Vickers Co. Ltd., Manchester, No. 18100, has been taken into stock. I saw it go "purring" out of Paddington at the end of May to make another time-gaining run to Bristol on *The Merchant Venturer*, this being my first view of the remarkably powerful machine.

Among express engines condemned are Star 4–6–0s Nos. 4036 *Queen Elizabeth*, 4038 *Queen Berengaria*, 4050 *Princess Alice*, 4054 *Princess Charlotte*, 4057 *Princess Elizabeth* and 4022, unnamed.

I was recently pleased to see No. 4056 *Princess Margaret*, in very clean green leaving the main Bristol shed to work up to London, and to note No. 4052 *Princess Beatrice* at Hereford. There are several others working, as well as a few 2-cylinder Saints which are to be seen in London, such as No. 2945 *Hillingdon Court*, though they are becoming scarce. No. 2953 *Titley Court* has been withdrawn, so have several of the ex-Welsh railways' tanks.

Going through from Paddington to Hereford behind No. 4093 *Dunster Castle*, I did not log anything like the thrilling speeds I experienced with that engine about 20 years ago under very different circumstances on the *Cheltenham Flyer* and one of the up Birmingham expresses. But it was an enjoyable run, with several of the minutes lost by signal and permanent way repair delays recovered. No. 7777, of the 57xx 0–6–0T class was at Reading West Yard; S.R. class U 2–6–0 No. 31616 (70E) was hauling a goods along the W.R. main line at Pangbourne; and the Castle rebuild No. 4037 *The South Wales Borderers* was passed on another freight train.

At Worcester, Shrub Hill, the W.R. 0–4–2T No. 5807, with a two-coach local, and L.M.R. class 5 4–6–0 No. 44965 (19B), in new lined black livery, were waiting to depart. From Hereford, where Lancashire and Yorkshire type 0–6–0s have lately been working, and where I saw No. 49046 7F 0–8–0 leaving the erstwhile L.N.W.R. shed, I travelled on to Bristol in the 13-coach Manchester-Plymouth through train headed by No. 1019 *County of Merioneth* working from Shrewsbury. We traversed glorious scenery as far as the outskirts of Newport, Mon., with some steep climbs, including the long ascent from the depths of the Severn Tunnel.

The only King stationed at Bristol, the pioneer *King George V*, had been restored to green livery and, like some other engines of the class, provided with increased superheat and mechanical lubricators.

My locomotives next (Sunday) morning on the 11.30 a.m. to Portsmouth were Castle No. 5074 *Hampden* as far as Salisbury, and No. 34109, *Sir Trafford Leigh-Mallory*, a Bournemouth "Battle of Britain," forward through Southampton and Netley. Again much of the scenery in early summer sunshine was a delight. Two S.R. 700 class 0–6–0s Nos. 30317 and 30690 from Salisbury were at Warminster with ballast or track renewal trains.

Scottish Notes

W.D. 2–8–0 No. 90464, formerly L.N.E.R. 63143, has been engaged in a long series of trials between Carlisle and Kilmarnock. No. 90108 of this 8F class has been transferred to Carlisle, Kingmoor, from the Eastern Region, to which one of the 2–10–0s, No. 90763, had gone on loan. As in other parts of the British Isles summer holiday services will be in full swing when these notes are read, probably producing many interesting locomotive workings.

Among engines stationed at Forfar shed, 63C, which are kept in commendable condition, are three 5F 2–6–0 "Crabs" numbered 42738, 42800–1; three ex-Caledonian 3P 4–4–0s, Nos. 54450, 54454, 54486, together with three 0–6–0s and seven 0–4–4Ts. 4–4–0 Compounds or other types are sometimes there on loan.

Very Fast Runs on the East Coast Route

Along the Anglo-Scottish main line of the Eastern and North Eastern Regions many fine runs have again been observed and reported recently. The fastest regular long-distance express, the *Tees-Tyne Pullman* with eight cars headed by *Silver Link*, a record-holding streamlined Pacific, was 14 min. late passing York on the southbound winter schedule, but reached King's Cross 2–3 min. early, having covered 184 miles in about 179 min., several slowings included.

Next day I saw the *Queen of Scots* with a rather heavier load run into King's Cross 7½ min. before time. Although *Abbotsford* of class A1 had left Leeds 6 min. late, it had gained more than 5 min. on the accelerated summer timing now in force and more than 13 min. on the timing then in operation. The three previous arrivals from Cambridge, Leeds and Peterborough respectively were 3–4 min. early, which was quite commonplace at the time. Fast trial runs were being made just then between King's Cross and Doncaster with varying loads of empty corridor coaches with the A4 No. 60003 *Andrew K. McCosh*, now, like many of the 4–6–2s, in dark green.

The beautifully-aligned and easily-graded 44-mile Darlington-York stretch boasts decidedly the quickest start-to-stop timings in Britain, which have now become more numerous and are in some cases faster than pre-war, and many splendid performances have been recorded. On the quickest, a 42-min. booking, A1 No. 60127 *Wilson Worsdell* with the nine-coach Newcastle-Birmingham express left Darlington 2 min. late, averaged just over 90 m.p.h. along 11 miles of faintly falling gradients with a maximum exceeding 92 and was then eased somewhat, but stopped in York punctually with 3 secs. to spare; 44 miles in 39 min. 57 sec. start to stop! Next day a much older A3, No. 60060 *The Tetrarch*, put on at short notice to haul 11 coaches, 370 tons full, lost half a minute, but gave a performance that would have been considered excellent on most trains, working up to 78 m.p.h.

Some of the loads are a good deal heavier, and this also applies in the opposite direction with the slight gradient largely against the engine, where there are timings nearly as fast. When Mr. N. R. Harvey secured these logs a severe slowing for repair work not far out of York was causing 3–4 min. loss, but No. 60137 *Redgauntlet* with 14 on, 470 tons, went from York to Darlington in 47½ min. overall or 44 min. nett, after a 2-min. late start on the 10.5 a.m. from King's Cross, known as the *Junior Scotsman*.

A very smart run by a veteran N.E.R. 4–4–0 of class D20 built in 1906, No. 62378, with five coaches, improved considerably on schedule from Selby to York, passing Chaloners Whin Junction, 11¾ miles in 13½ min. having touched 61 m.p.h. after a fast start on the level.

Western 4-6-0 No. 6813 Eastbury Grange getting away briskly from Penzance with an express train. Photograph by F. Ashley.

Special Train Tours over Unusual Routes

For members and railway enthusiast friends several more special train tours organised by the Stephenson Locomotive Society, have lately taken place, in one instance jointly with the Manchester Locomotive Society, traversing at times lines long closed to passenger traffic or never used. One train in the Glasgow area involving a number of reversals was hauled by a Caledonian type 4–6–0 No. 54634. Another, from Crewe through the Potteries to Rudyard Lake and over "defunct" N.S.R. lines, was with ex-L. and Y. 2–4–2T, No. 50703; and another, from Coventry and Nuneaton to Loughborough and Swadlincote, was in charge of a modern 2–6–2T, No. 41218.

Shocks and Shocvans

British Railways are increasing their fleet of 3,500 shock-absorbing freight vehicles. The bodies of these "*Shocks*" (open wagons) and "*Shocvans*" (covered vans), can slide backward and forward on the chassis, the movement being limited by rubber springs. The result is that the effects of shunting are "cushioned" and fragile consignments such as glass, china and earthenware travel with the minimum risk of damage. The new vehicles will number 1,600.

"Beware of the train!" Romney, Hythe and Dymchurch No. 7 Typhoon approaches Botolph's Bridge while the motor car waits at the level crossing. "M.M." Prizewinning photograph by M. E. Ware.

Among the Model-Builders

By "Spanner"

A. M. Hardie, Aberdeen, won First Prize in a recent "M.M." Competition with a wonderful model of a radio wave synthesizer.

A MECCANO REVOLUTION COUNTER

T. Harris, Blackpool, has sent me details of a rather unusual mechanism he designed for use in a coil winding machine he built recently. The mechanism is a registering device for counting the number of turns of wire wound on each coil, and it is illustrated in Fig. 1.

Harris tells me that the construction of a mechanism counting in units of ten set him quite a problem until he found that the Meccano Ratchet Wheel has 20 teeth. It was then necessary only to devise a scheme for moving the Ratchet Wheel two teeth at a time, so that each complete revolution of the Wheel indicated ten turns of wire. The arrangement he employed is very simple, and it can be applied to many other machines and instruments where an automatic revolution indicator is required.

The base of the housing is a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate fitted at one side with a $5\frac{1}{2}''$ Flat Girder 1. A second Flat Girder 2 is bolted to a $5\frac{1}{2}''$ Angle Girder, which is fixed so as to leave one clear hole between the Girder and the front of the base.

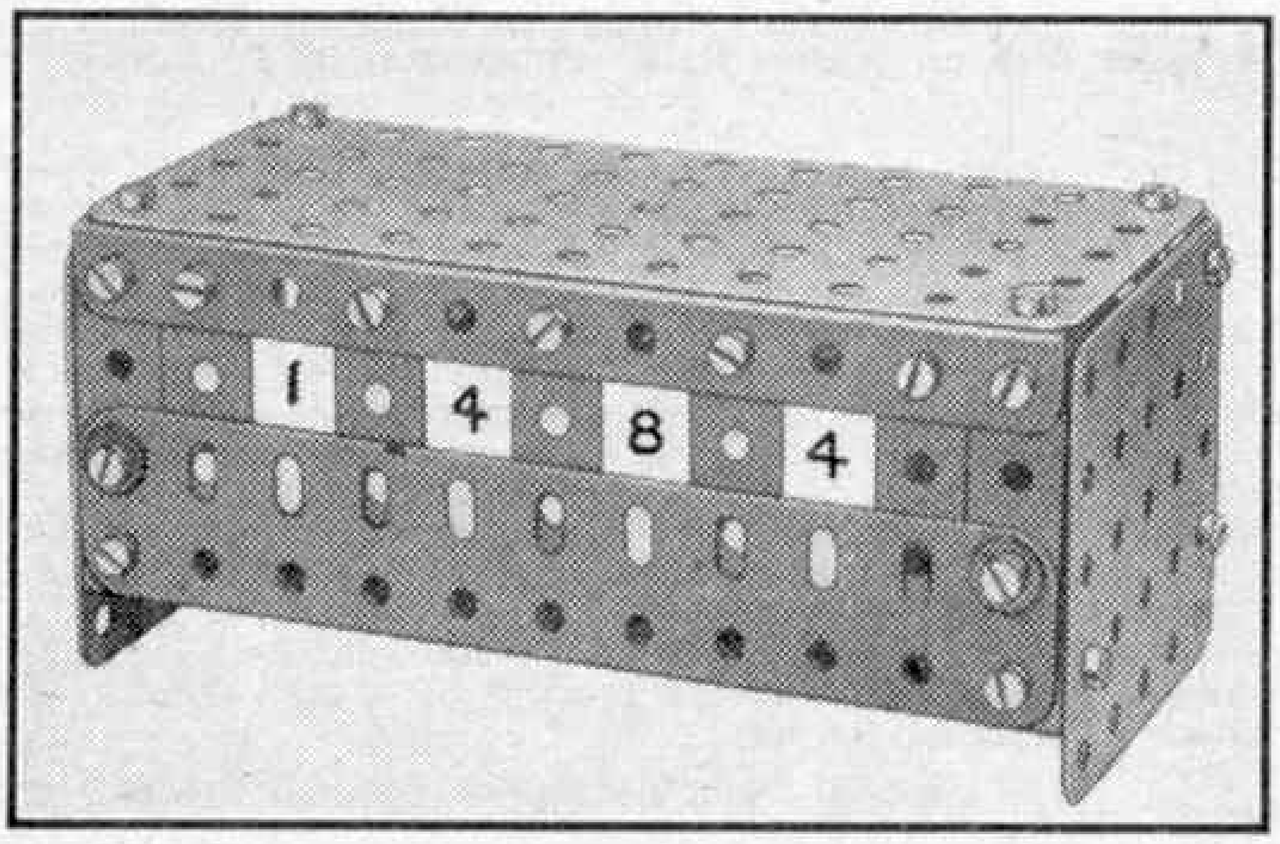


Fig. 1. A revolution counter that works accurately. It is made entirely from Meccano parts.

The single units shaft is a $3\frac{1}{2}''$ Rod 3 mounted in the Flat Girders and held in position by Collars. The Rod is fitted with a Fishplate 4 that is fixed to a Collar by a bolt passed through the slotted hole of the Fishplate and into one of the threaded holes of the Collar. Three Washers are placed on the bolt, and the Fishplate is adjusted so that it will just engage the teeth of a Ratchet Wheel fixed on the "tens" shaft, which is a $2\frac{1}{2}''$ Rod 5 fitted with a Fishplate fixed in the same way as Fishplate 4. This second Fishplate engages a Ratchet Wheel on the "hundreds" shaft 6, and a similar arrangement is used to drive the "thousands" shaft 7. Collars are used to hold the shafts in position, and are pressed fairly hard against the Flat Girders, so that the Rods are restrained from moving freely and there is no tendency for them to overrun.

Each shaft carries at its front end a Bush Wheel, to which a paper disc is glued. The discs are marked with figures 0–9 inclusive, evenly spaced, and the mechanism is adjusted so that when the figure 9 appears in the indicating window for any one shaft, the Fishplate on this shaft is just about to engage the teeth of the Ratchet Wheel on the succeeding shaft. The Ratchets are arranged with their teeth facing in opposite directions, as of course the intermittent drive has the effect of reversing the direction of the drive between two shafts in the same way as ordinary meshing gears.

The single units shaft is fitted with a Sprocket Wheel, and it should be driven at 1/10th the speed of the machine driving shaft. A simple cover can be fitted to the mechanism as shown in Fig. 1, so that only one number at a time appears in the centre of each indicating window.

"PENNY-IN-THE-SLOT" RELEASE MECHANISM

The mechanism shown in Fig. 3 was designed by H. Taylor, Huddersfield, and was used by him in an automatic machine he built recently. It is shown fitted to part of the framework of the model, but it can be adapted quite easily to suit other models operated on the "penny-in-the-slot" principle.

The coin slot is formed from four $5\frac{1}{2}''$ Angle Girders, bolted together in pairs by their slotted holes, so that a gap sufficient to allow a penny to slide freely, is left between their narrow flanges. The pairs of Girders are connected by three $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips, placed one at each end and one as indicated at 1. The Double Angle Strip 1 is used to attach the coin slot to a $1\frac{1}{2}''$ Angle Girder bolted to the framework. Two $\frac{3}{8}''$ Bolts are passed through the Double Angle Strip and the

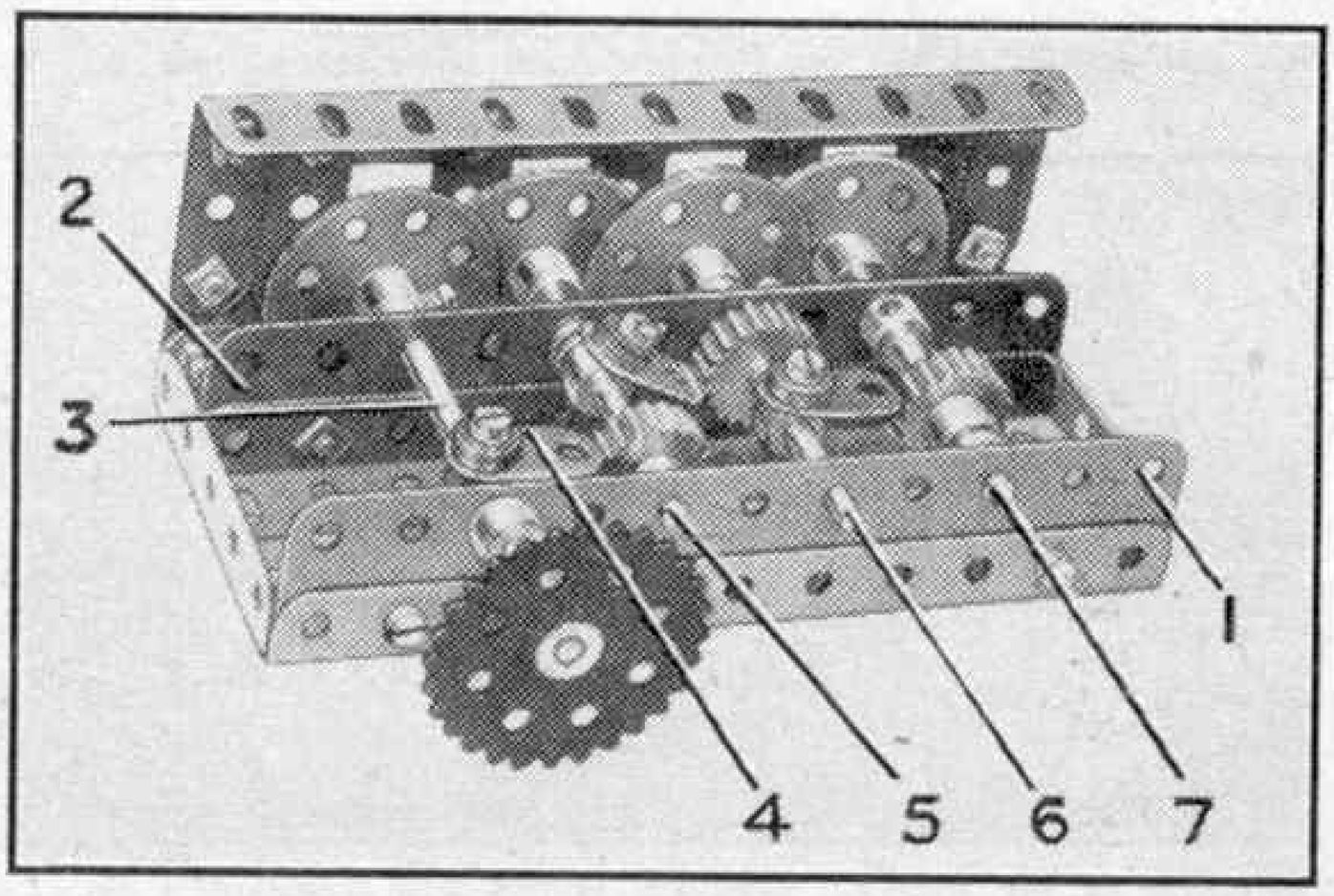


Fig. 2. The interior mechanism of the revolution counter. It is quite simple and requires only a few parts.

Angle Girder, and they are fitted with lock-nuts so that the coin slot is free to pivot through a small angle. A 2½" stepped Curved Strip 2 is bolted tightly to the slot at its lower end.

When a penny is inserted in the slot it falls on to a weighted lever formed from three 5½" Strips 3. Several 1½" Strips are bolted to one end of the lever, so that the weight of the penny is just sufficient to tilt the lever about its axis, which is a Rod held in a Double Arm Crank 4 bolted to the framework. A Bell Crank 5 is bolted to the lever. A Coupling 6 is also loosely mounted on the Rod and is held in place by a Collar.

R. G. Holding, Colwyn Bay, one of the prize-winners in the "Christmas" Model-Building Competition.

A Rod 7 is free to slide in the turned-up ends of a 3½" × ½" Double Angle Strip bolted to the framework, and the Rod is linked to one arm of Bell Crank 5 by a bolt screwed into a Collar on the Rod. When the lever 3 is in its normal position the end of Rod 7 engages below the operating lever of the mechanism, which in this case is a Strip 8 pivoted at one end and controlled by a Driving Band 9. The Strip 8 cannot be depressed until the lever 3 is tilted by inserting a penny in the slot. As the lever tilts the Rod 7 is withdrawn and the Strip 8 is then free to move.

The coin rests on lever 3 until the action of the mechanism is completed and the Driving Band returns the Strip 8 to its normal position. Strip 8 then engages a Rod 10 fixed in a Coupling on the end of a vertical Rod 11, which is free to slide in Flanged Brackets bolted to the framework. Rod 11 is raised slightly as Strip 8 is returned by the Driving Band, and a 1" Pulley 12 on the Rod lifts a Rod held in the Coupling 6. A short Rod is also gripped in Coupling 6, and a 1" loose Pulley 13 is free to turn on a ⅜" Bolt screwed into a Collar on the end of this Rod. The Pulley rides on the edge of Curved Strip 2, and as Coupling 6 pivots under the action of the Pulley 12, Pulley 13 descends and forces the coin slot slightly to the rear. This action frees the coin from the end of lever 3, and the lever returns to its normal position to reset the mechanism.

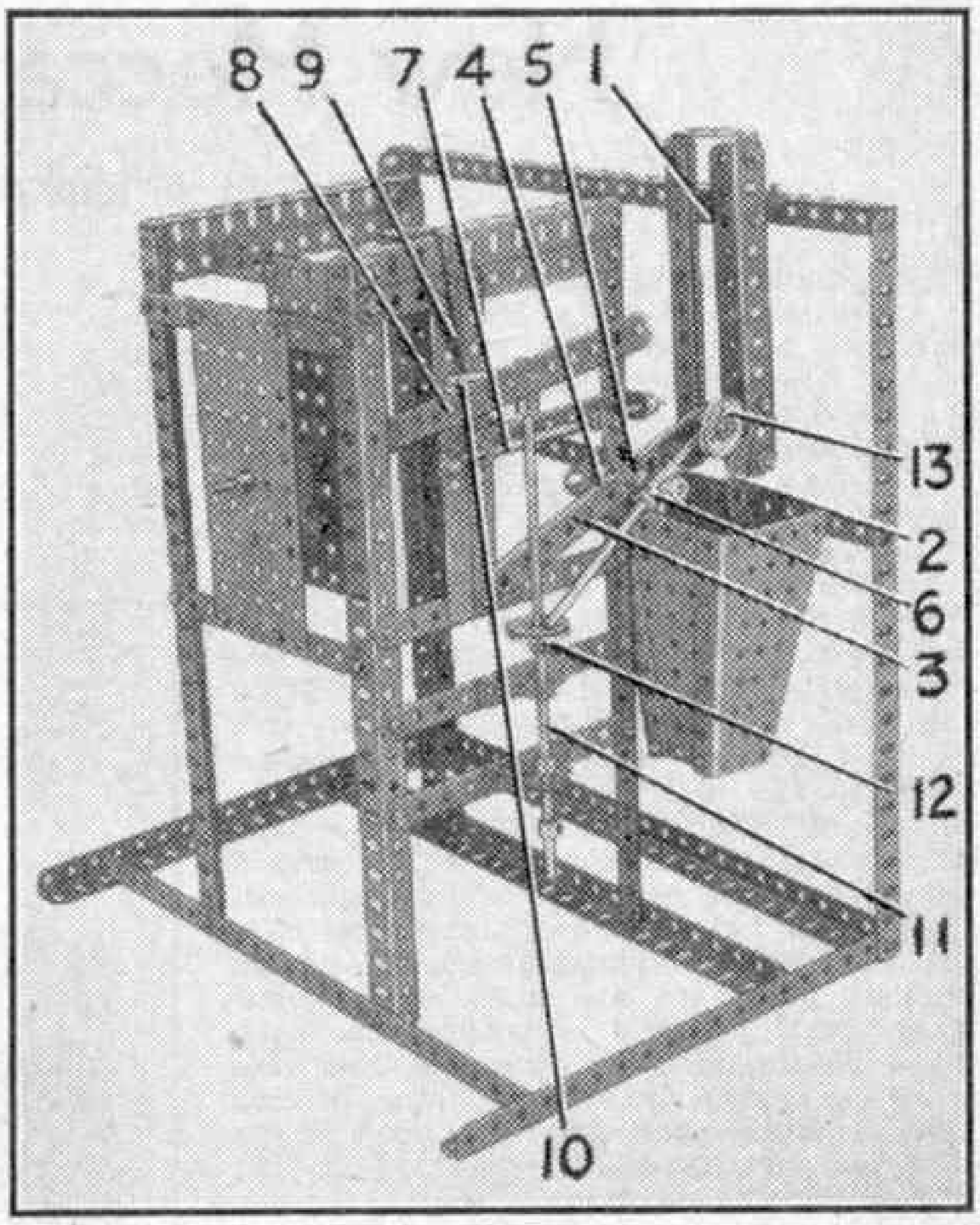


Fig. 3. A suggested method of constructing a "penny-in-the-slot" mechanism, submitted by H. Taylor, Huddersfield.

A NOVEL RIGHT-ANGLE DRIVE

An interesting novelty of Meccano construction is shown in Fig. 4. It is a right-angle drive which uses peg-teeth gears built up by fixing Threaded Pins in Bush Wheels. The mechanism works quite efficiently but is intended more as a novelty than a practical gear-drive for incorporation in Meccano models.

A SMALL BUILT-UP PAWL

In some mechanisms where a ratchet and pawl is required there is insufficient space to allow the ordinary Meccano Pawl to be used, and in these cases a built-up pawl of the kind described here might serve the purpose. A "spider" from a Universal Coupling is pivoted to a Girder or Strip, in the next hole to that in which the Ratchet Wheel is mounted, by means of a bolt screwed into one of its tapped holes and locked in place by a nut. A ½" Bolt is then screwed through the transverse tapped holes, so that its protruding end engages the teeth of the Ratchet. Spring Cord can be used for holding the pawl in place, the end of the Cord being looped and inserted under the head of the ½" Bolt.

A pawl and ratchet mechanism is useful in models where a free-wheel arrangement is needed to allow the model to overrun its power unit when the drive is disengaged. Roundabouts and Big Wheels are typical examples of models in which free-wheel mechanisms are useful, as they allow the models to come to rest gradually. The pawl and ratchet described here can be used as a free-wheel by attaching the pawl to a Bush Wheel on a shaft driven by the Motor. The Ratchet Wheel is fixed on the model driving shaft.

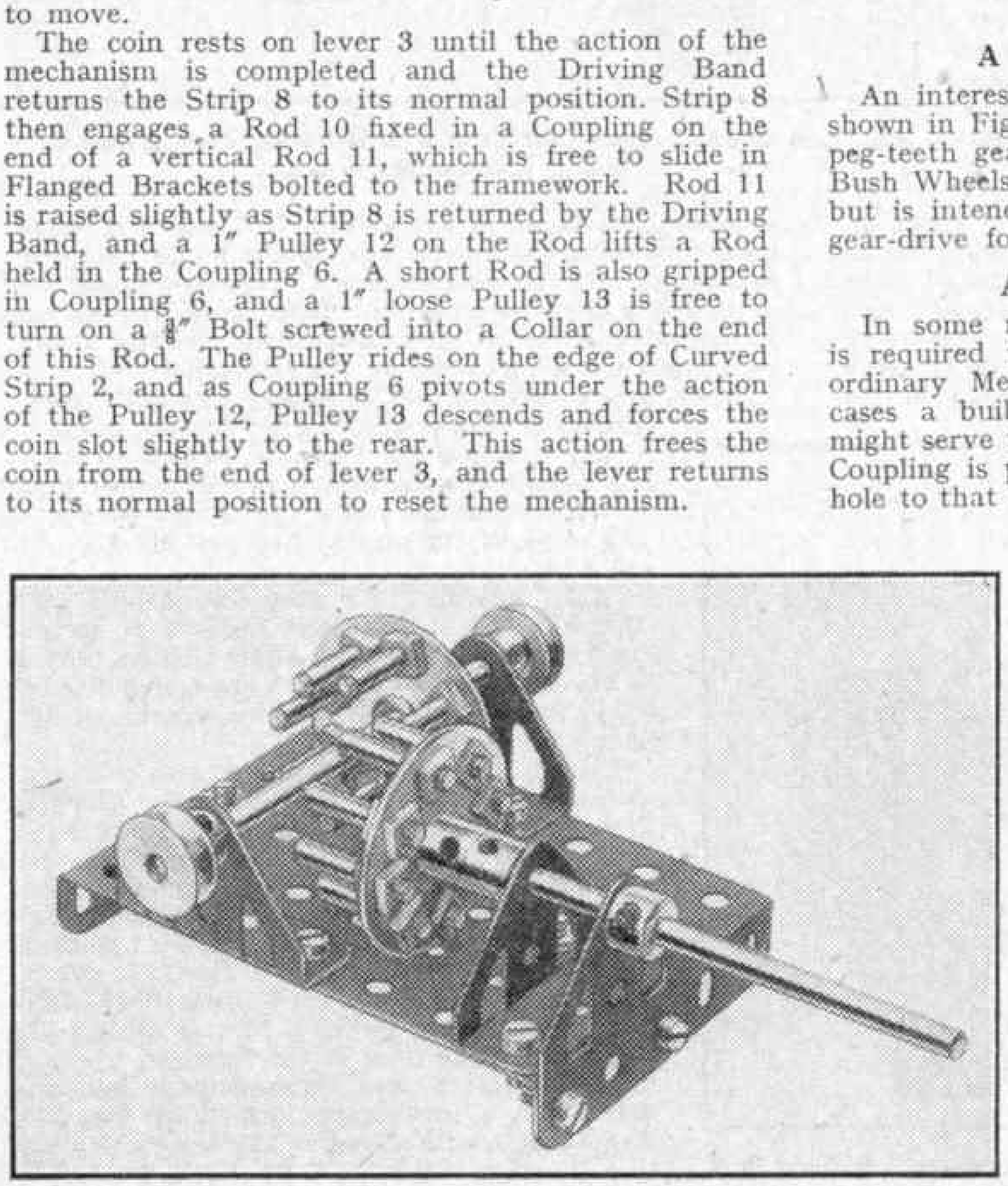


Fig. 4. The novel right-angle drive referred to on this page.

New Meccano Models

Dumper Truck—Horizontal Steam Engine

THE simple dumper truck shown in Figs. 1 and 2 shows well how a No. 1 Clockwork Motor can be built into a model made with one of the smaller Outfits. The dumper truck is constructed from parts in a No. 3 Outfit, and an interesting feature of it is that the Motor is used as the basic chassis of the model.

The Motor is placed horizontally with its winding spindle pointing downward, and two 5½" Strips 1 are bolted to Angle Brackets fixed to its lower side-plate. The Angle Brackets are adjusted to a slight angle so that the 5½" Strips assume a triangular position. The rear wheels of the model are 1" Pulleys fitted with Motor Tyres, and they are fixed on a 3½" Rod passed through Flat Trunnions bolted to the rear ends of Strips 1. The bolts fixing the Flat Trunnions also hold Trunnions 2 in position, and a 2½" Strip 3 is bolted between the flanges of the Trunnions.

A 4" Rod forms the front axle, and it is passed through Fishplates attached to Angle Brackets bolted to the front edge of the Motor. A 1" Pulley 4 is fixed on the axle, and a Driving Band is passed round this Pulley and also round the Motor driving shaft. A Washer and a Spring Clip 5 on the lower end of the shaft serve to keep the Driving Band in position.

The base of the hopper is a 5½" × 2½" Flanged Plate, and its sides are formed by 5½" Strips 6 and 2½" Strips 7. Each side is filled in by a 2½" × 1½" Flexible Plate and a Semi-Circular Plate, and the back is a 2½" × 2½" Flexible Plate bolted to a 2½" × ½" Double Angle Strip fixed between the sides. The hopper pivots on a 3½" Rod passed through a 2½" Strip 8 on each side. These Strips are fixed to Angle Brackets bolted to the upper side-plate of the Motor.

The engine housing is represented by a 5½" × 1½" Flexible Plate curved to U-shape and bolted at one end to one of the Strips 1. Its other end is attached to an Angle Bracket fixed to the Strip 3. The driver's seat is a Wheel Disc attached to the engine housing by an Angle Bracket, and the steering wheel is a Bush Wheel fixed on a Rod passed through holes in the Motor side-plates and held in place by a Spring Clip.

Parts required to build the model Dumper Truck: 4 of No. 2; 5 of No. 5; 2 of No. 10; 8 of No. 12; 1 of No. 15b; 3 of No. 16; 3 of No. 22; 1 of No. 24; 1 of No. 24a; 6 of No. 35; 32 of No. 37; 3 of No. 38; 1 of No. 48a; 1 of No. 52; 2 of No. 126; 2 of No. 126a; 2 of No. 142c; 1 of No. 186; 2 of No. 187; 2 of No. 188; 1 of No. 189; 1 of No. 190; 2 of No. 214; 1 No. 1 Clockwork Motor.

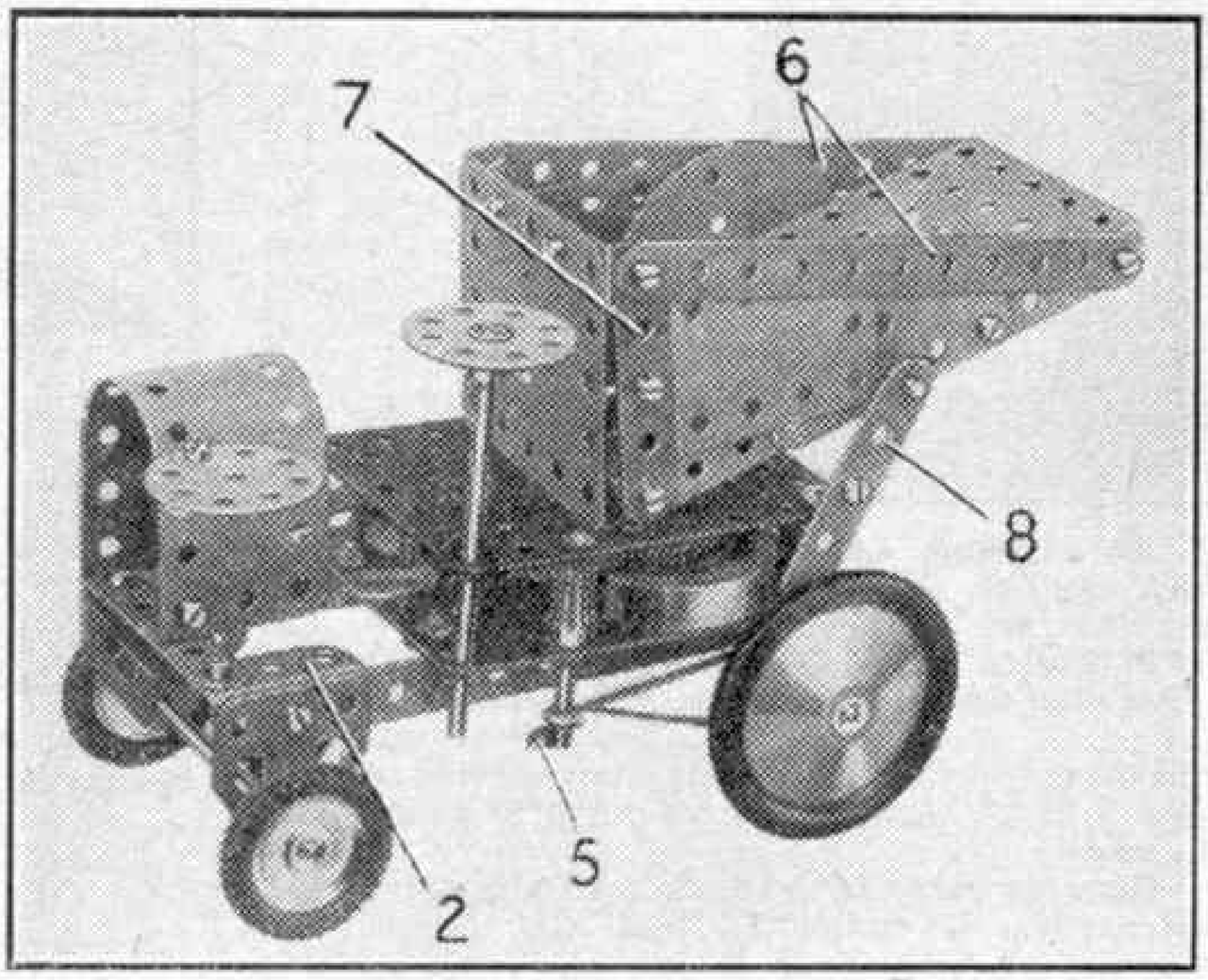


Fig. 1. A dumper truck built from Outfit No. 3. It is driven by a No. 1 Clockwork Motor.

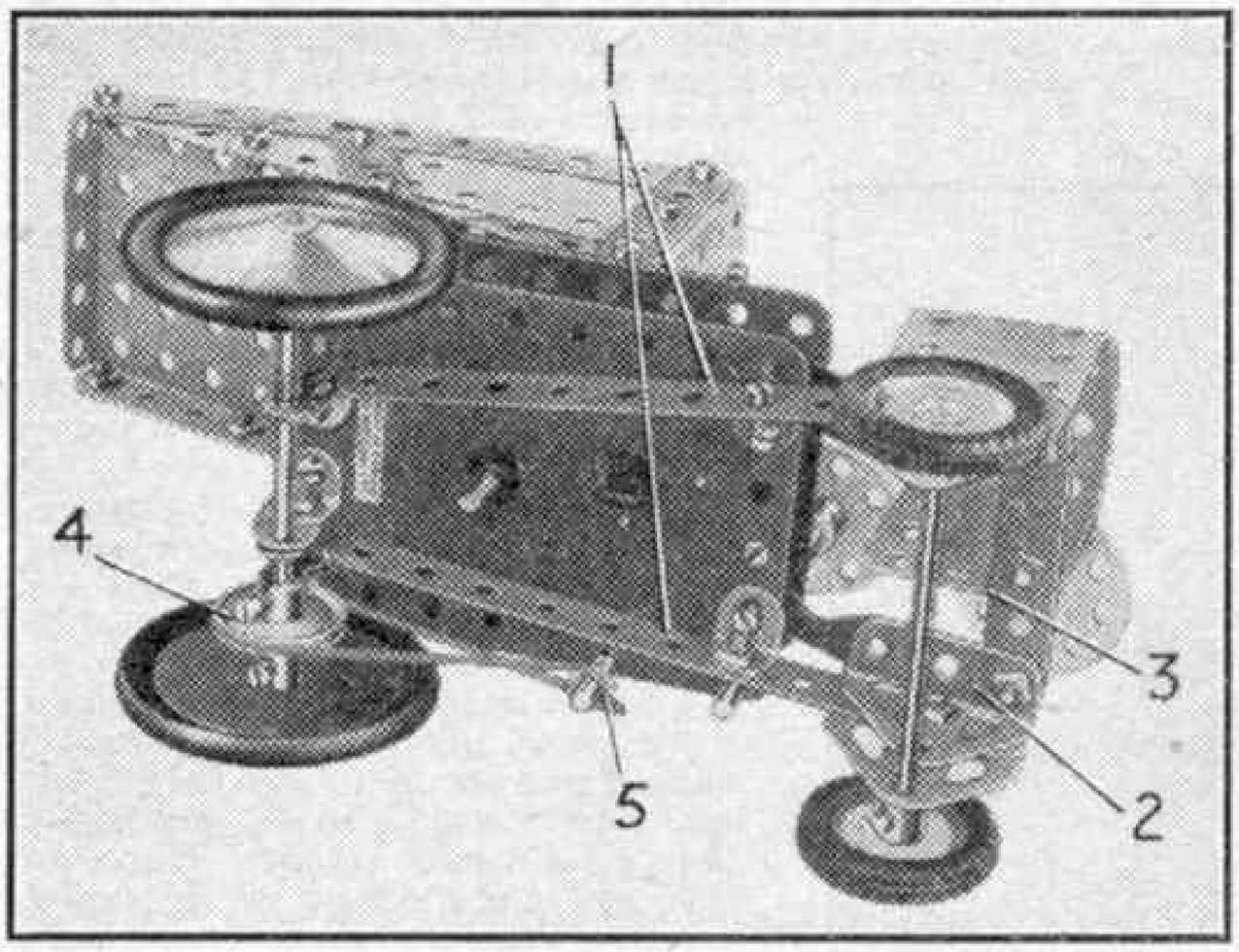


Fig. 2. The dumper truck seen from underneath, showing how the Motor forms part of the chassis.

The steam engine shown in Figs. 3, 4 and 5, is based on a type that was once very popular for driving mill machinery. It is quite easy to construct and is delightfully effective in action. It can be set in motion by coupling either a Clockwork or an Electric Motor to a Sprocket Wheel fixed on the crankshaft.

The engine bed is built up by joining two 12½" Angle Girders at each end by the 5½" Angle Girders 1. A 12½" × 2½" Strip Plate is bolted to each 12½" Angle Girder, and is braced by vertical 2½" Angle Girders and a 12½" Angle Girder 2. The ends of the engine bed are filled in by 4½" Strips.

The bearings for the crankshaft are supported by 12½" Angle Girders 3, which are fixed to further 12½" Angle Girders bolted to the Girders 2. Girders 3 are connected by a 3½" Angle Girder 4, and by a series of 3½" Strips 5.

The crankshaft is supported in two bearings, each of which consists of two 2½" × 1½" Flanged Plates joined by their flanges and fitted with Semi-Circular Plates 6. The bearings are attached to the Girders 3 by Angle Brackets. The crank webs are Flat Trunnions, each fitted with two Cranks 7 and 8. One web is mounted on a 2" Rod that carries a Bush Wheel 9, and the other is fixed on a 3" Rod 10. Rod 10 is fitted with a 2" Sprocket 11, a 2" Pulley 12, and a 6" Pulley used as the flywheel.

The cylinder and crosshead guides are carried on a framework formed by two 7½" Angle Girders 13 bolted to 12½" Angle Girders that overlap Girders 3 by 22 holes each. Girders 13 are connected by a 4½" Strip 14,

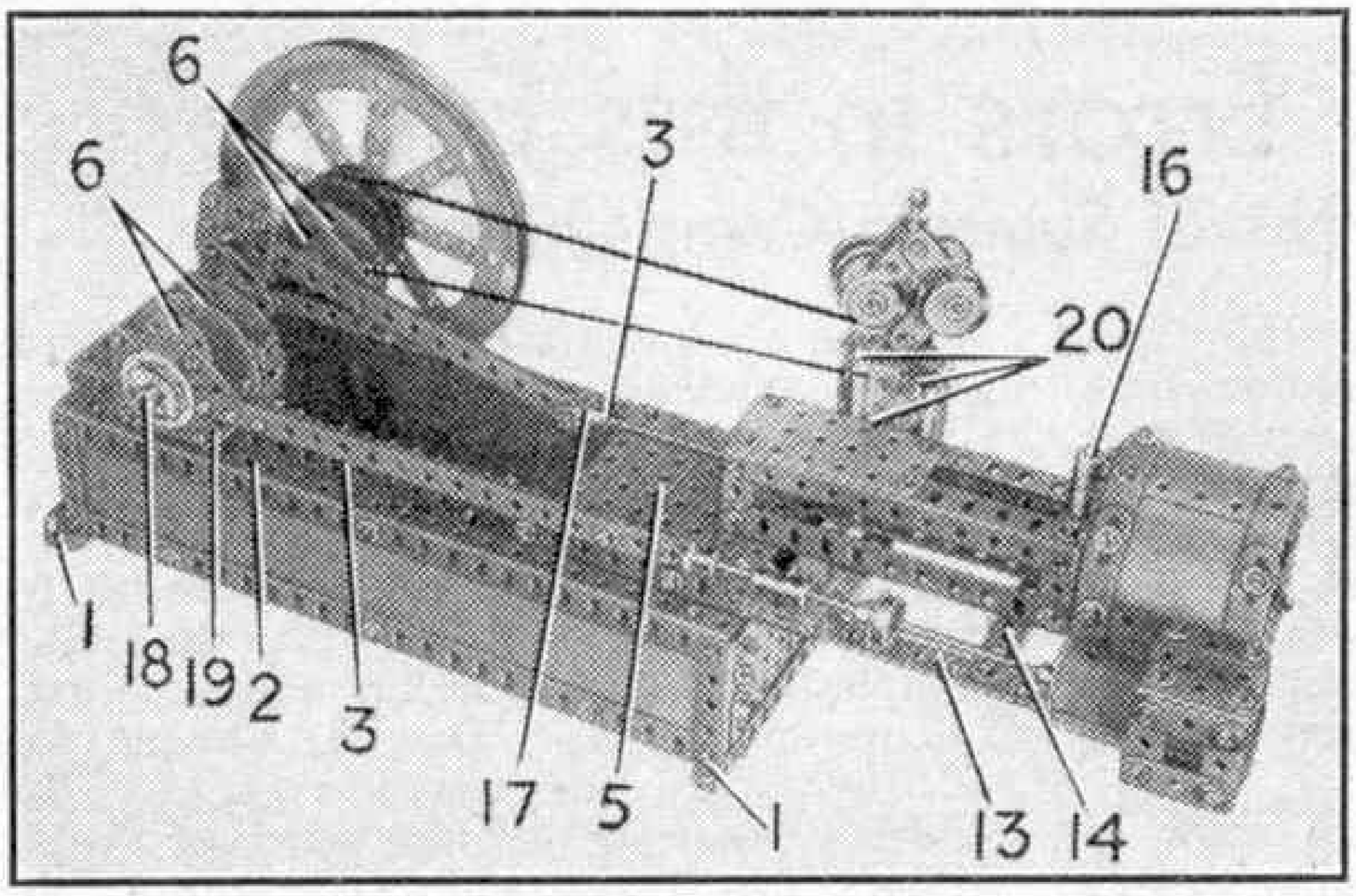


Fig. 3. A single-cylinder horizontal steam engine.

and the crosshead guides are bolted to this Strip and to Strips 5. The guides are formed by four $5\frac{1}{2}$" Angle Girders built into a box section by means of $1\frac{1}{2}$" Strips. The piston rod slides in a $5\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip bolted to a $5\frac{1}{2}$" Angle Girder fixed to a similar Girder 15.

The cylinder is assembled from one $2\frac{1}{2}" \times 2\frac{1}{2}"$ and two $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flexible Plates, curved round the cylinder ends, each of which is formed by four $2\frac{1}{2}$" Stepped Curved Strips. The Flexible Plates are attached to Angle Brackets bolted to the ends. The complete cylinder is fixed to an Angle Bracket bolted to the lower front edge of the crosshead guides, and is attached to the upper edge by an Angle Bracket held between Collars on a $1\frac{1}{8}$" Bolt 16.

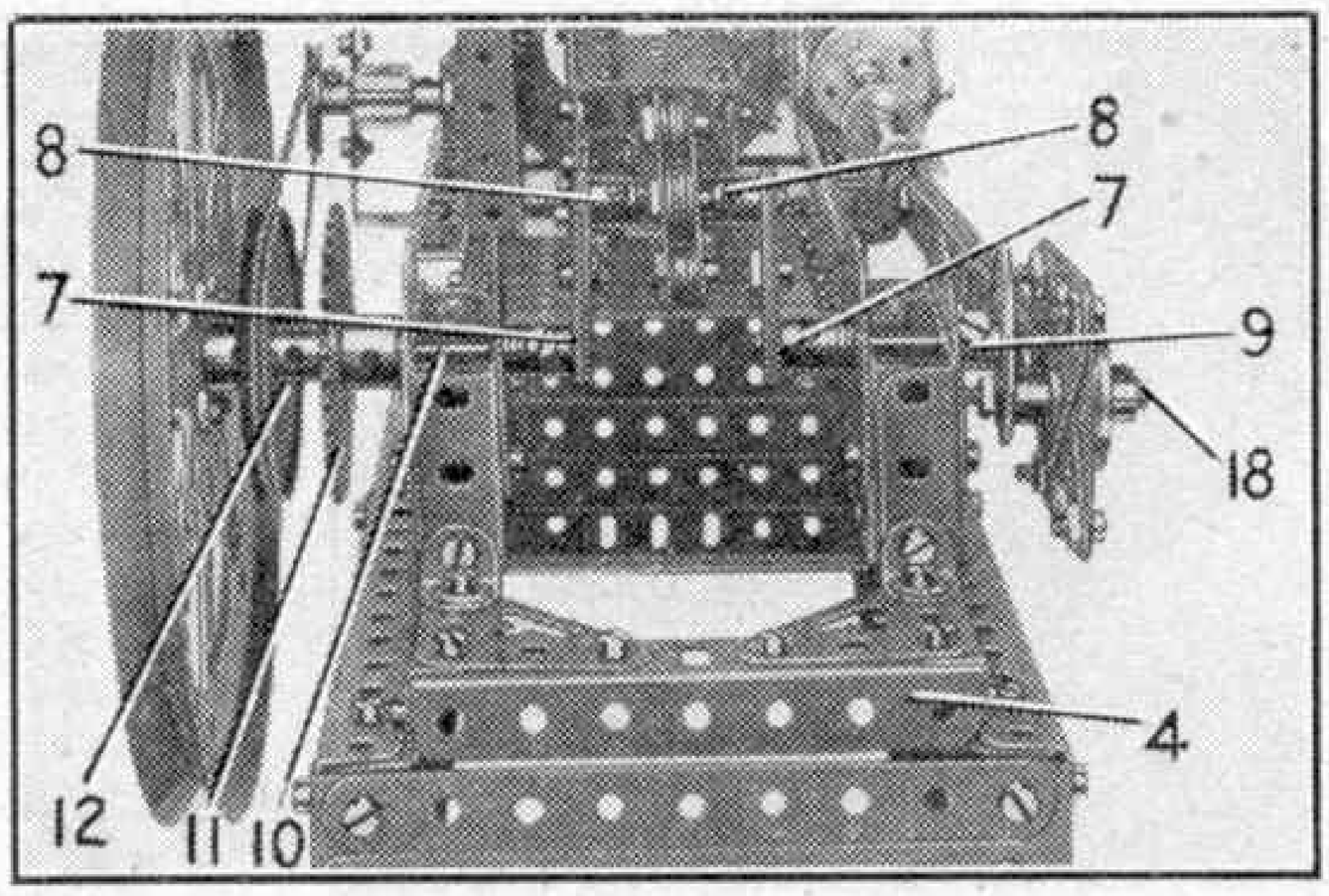


Fig. 4. An end view of the steam engine showing details of the crankshaft.

The connecting rod is formed by four $7\frac{1}{2}$" Strips, and it pivots on a $\frac{3}{4}$" Bolt fixed across a large Fork Piece 17 on the piston rod. The "big end" is made from $1\frac{1}{2}$" Strips arranged in the form of a square round the end of the connecting rod, and it is carried on a $1\frac{1}{2}$" Rod fixed in Cranks 8.

The eccentric consists of four $1\frac{1}{2}$" Corner Brackets bolted together to form a square, and it is mounted on a $1\frac{1}{8}$" Bolt 18 fixed in the Bush Wheel 9 by two nuts. A Collar, a 1" loose Pulley, and Washers are used on the Bolt for spacing purposes.

Four $9\frac{1}{2}$" Strips are fixed to a $1\frac{1}{2}$" Corner Bracket 19 bolted to the eccentric. These Strips are extended two holes by $1\frac{1}{2}$" Strips, which are lock-nutted to a small Fork Piece on the valve rod. The valve chest is represented by a Cylinder fitted with a $1\frac{1}{8}$" Flanged Wheel, and it is bolted to one of the Girders 13. One end of the Cylinder is surrounded by a box framework built up from $1\frac{1}{2}$" Angle Girders and $1\frac{1}{2}$" Strips.

The governor mounting consists of three $2\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips 20, and a $2\frac{1}{2}" \times 1"$ Double Angle Strip 21. These are connected at the top by $1\frac{1}{2}$" Strips, and the governor shaft is passed through the centre holes of the Strips.

The governor consists of four $1\frac{1}{2}$" Strips pivoted on bolts screwed into a Collar at the top of the shaft. The lower ends of the Strips are connected in pairs to similar Strips pivoted on bolts fixed in a second Collar. The governor weights are 1" Pulleys and they are fixed on the $1\frac{1}{2}$" Rods used to link the arms together.

The drive to the governor is taken by a belt of Cord from the 2" Pulley 12 to a 1" Pulley 22. This Pulley is carried on a $1\frac{1}{2}$" Rod mounted in Double Angle Strip 21 and a Double Bent Strip, and a $\frac{7}{8}$" Bevel Gear on the Rod meshes with a similar Gear fixed on the governor shaft.

If a Clockwork or Electric Motor is available the drive should be taken by Chain to the 2" Sprocket 11 on the crankshaft.

Parts required to build the model Horizontal Steam Engine: 8 of No. 1b; 9 of No. 2a; 8 of No. 3; 41 of No. 6a; 8 of No. 8; 2 of No. 8b; 8 of No. 9; 3 of No. 9b; 4 of No. 9d; 6 of No. 9f; 14 of No. 12; 3 of No. 15; 1 of No. 15a; 1 of No. 16b; 6 of No. 18a; 1 of No. 19c; 1 of No. 20; 1 of No. 20a; 1 of No. 20b; 7 of No. 22; 1 of No. 22a; (*Continued on page 382*)

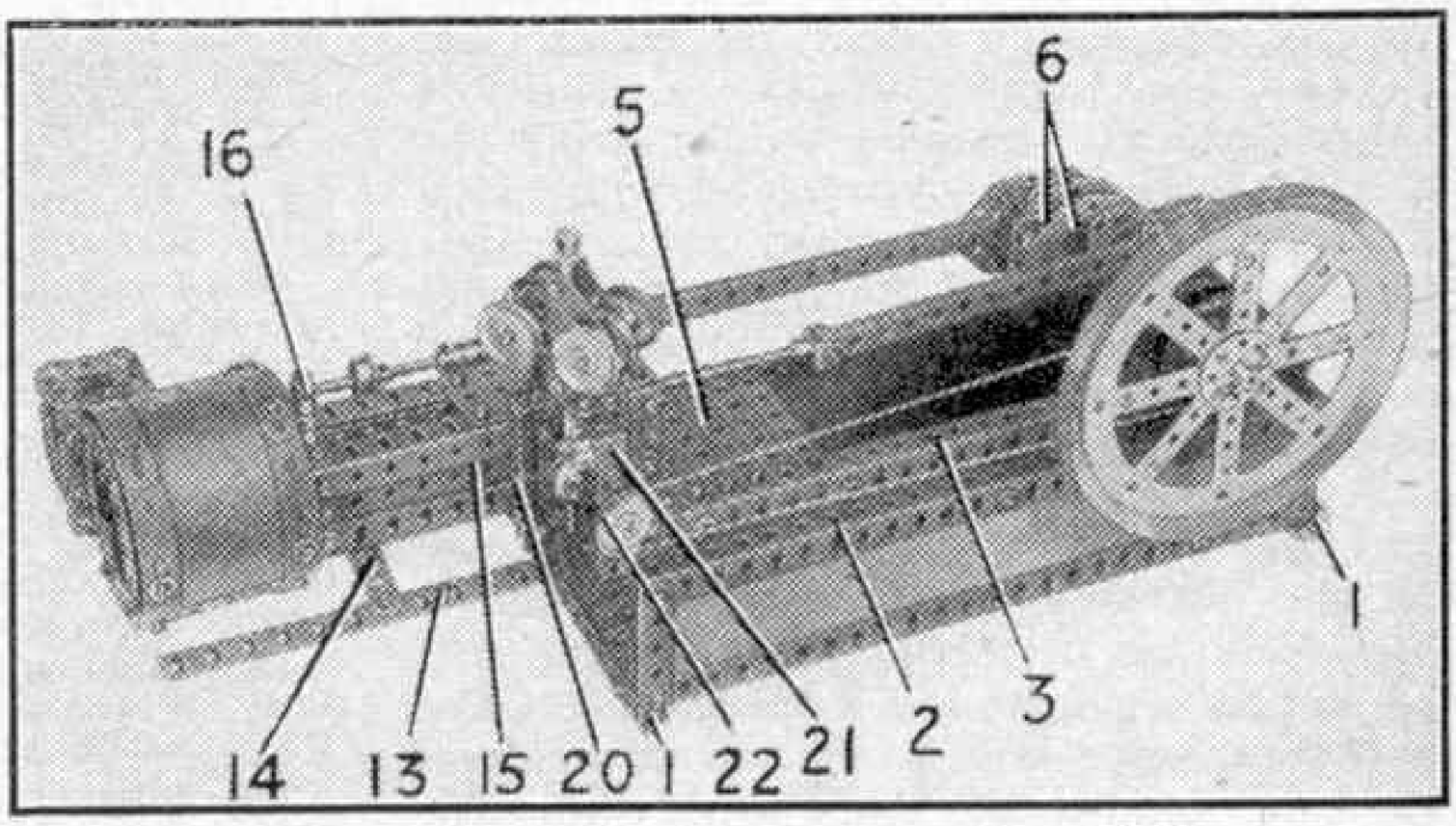


Fig. 5. The steam engine seen from the flywheel side.

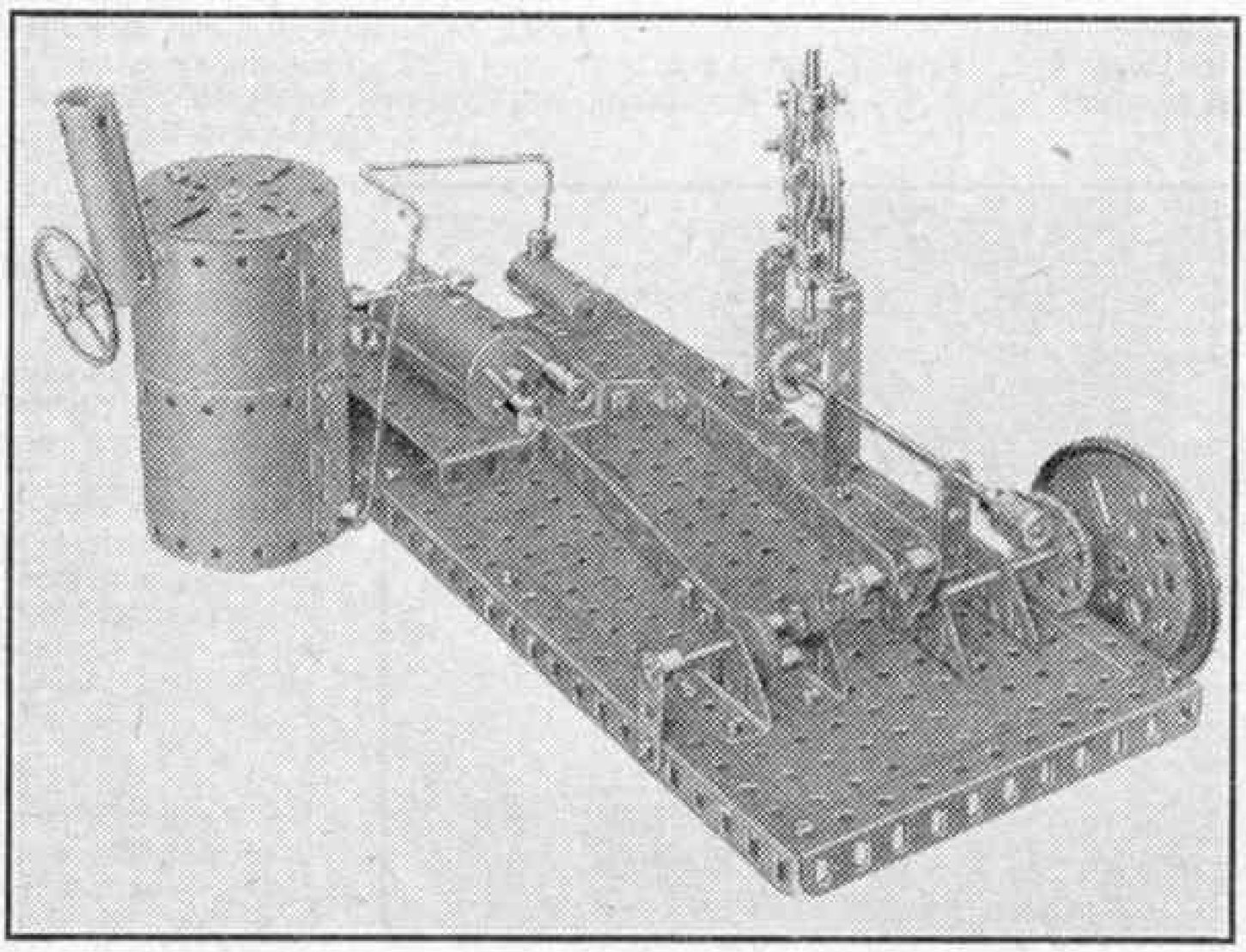
How Many Errors in this Engine?

Another Novel Summer Competition

THIS month we announce the third and last of our series of special summertime competitions. These contests are designed so that readers can prepare their entries just as easily on holiday as at home. No model-building of any kind is required, and the only equipment necessary is a piece of paper and a pen or pencil. Every reader will seize this opportunity to win a fine cash prize.

The illustration on this page shows a remarkable model. It looks like an engine and boiler, but a glance will show that in both design and construction it is unusual, to say the least. Closer inspection will reveal that the model is full of constructional mistakes and errors in design. Indeed it is so completely ridiculous that it could be described as a model-builder's nightmare! Actually the model was built specially for the purpose of this competition, and all the mistakes in its construction are intentional.

We ask readers to study the illustration carefully and then list on a piece of paper all the mistakes they can find. Some of the errors are perfectly ridiculous and will be seen at a glance, but more careful study and sharp eyes will be needed to disclose the others, especially some connected with the design and layout of the model.



This weird model would not win a prize in a Meccano Competition! But it is an excellent subject for the "Sharp Eyes" Contest announced on this page.

When a competitor thinks he has found all the mistakes he should send in his complete list to *"August Sharp Eyes Competition, Meccano Magazine, Binns Road, Liverpool 13."*

The following prizes will be awarded to the competitors who send in the most complete lists of genuine errors: First, Cheque for £3/3/–; Second, Cheque for £2/2/–; Third, Cheque for £1/1/–. In addition there will be five prizes of Postal Orders for 10/6, and five Consolation prizes each of 5/–.

The competition is open to readers of all ages living in any part of the world, and will remain open for entries until 31st October, 1952.

Before posting their entries competitors should make sure that they have stated their age, name and full postal address clearly.

If several competitors succeed in spotting all the errors in the model, their ages, and the neatness of their entries, will be taken into consideration in making the awards.

Model-Building Competition Results

March "Outfits" Contest
(Home Sections)

Section A. (For models built from Outfit No. 2)

First Prize, Cheque for £3/3/–: M. V. Hone, Winchester. Second Prize, Cheque for £2/2/–: S. D. James, Ruislip. Third Prize, Cheque for £1/1/–: R. M. Minshull, Macclesfield.

Five Prizes, each of 10/6: D. S. Lewis, Ferryside, Carms; D. Guyton, Tonbridge; J. Kay, Eccleston; C. E. Wrayford, Bovey Tracey; F. G. Glass, Croydon.

Five Prizes, each of 5/–: D. H. Newsam, Baldersby St. James; I. L. Jones, Burnage; R. Wallington, London S.E.23; D. J. Harwood, Aylesbury; A. Parke, Coleraine.

Section B. (For models built from Outfit No. 7)

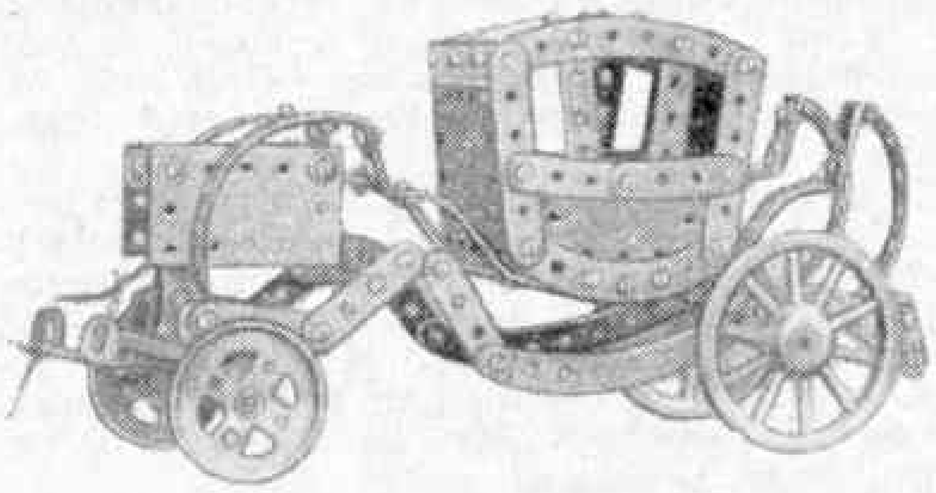
First Prize, Cheque for £3/3/–: R. Martin, Ewhurst. Second Prize, Cheque for £2/2/–: K. S. Willett, Canterbury. Third Prize, Cheque for £1/1/–: I. G. Trainer, Liverpool 10.

Five Prizes, each of 10/6: J. W. Thompson, King's Lynn; J. MacCulloch, Bury St. Edmunds; R. J. Hall, Bungay; D. E. Horne, Birkenhead; A. Perkin, Didcot.

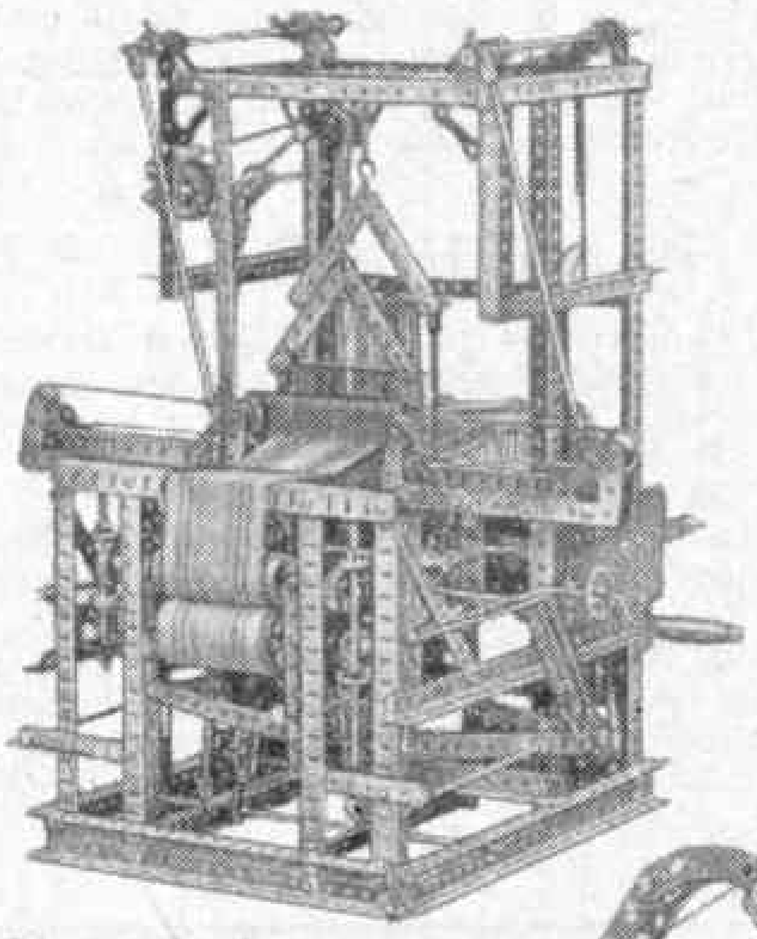
Five Prizes, each of 5/–: J. Moore, Epsom Downs; D. T. Baker, Cambridge; K. Pearson, Surbiton; R. Hughes, Walsall; D. Wallis, Swindon.

Great News!

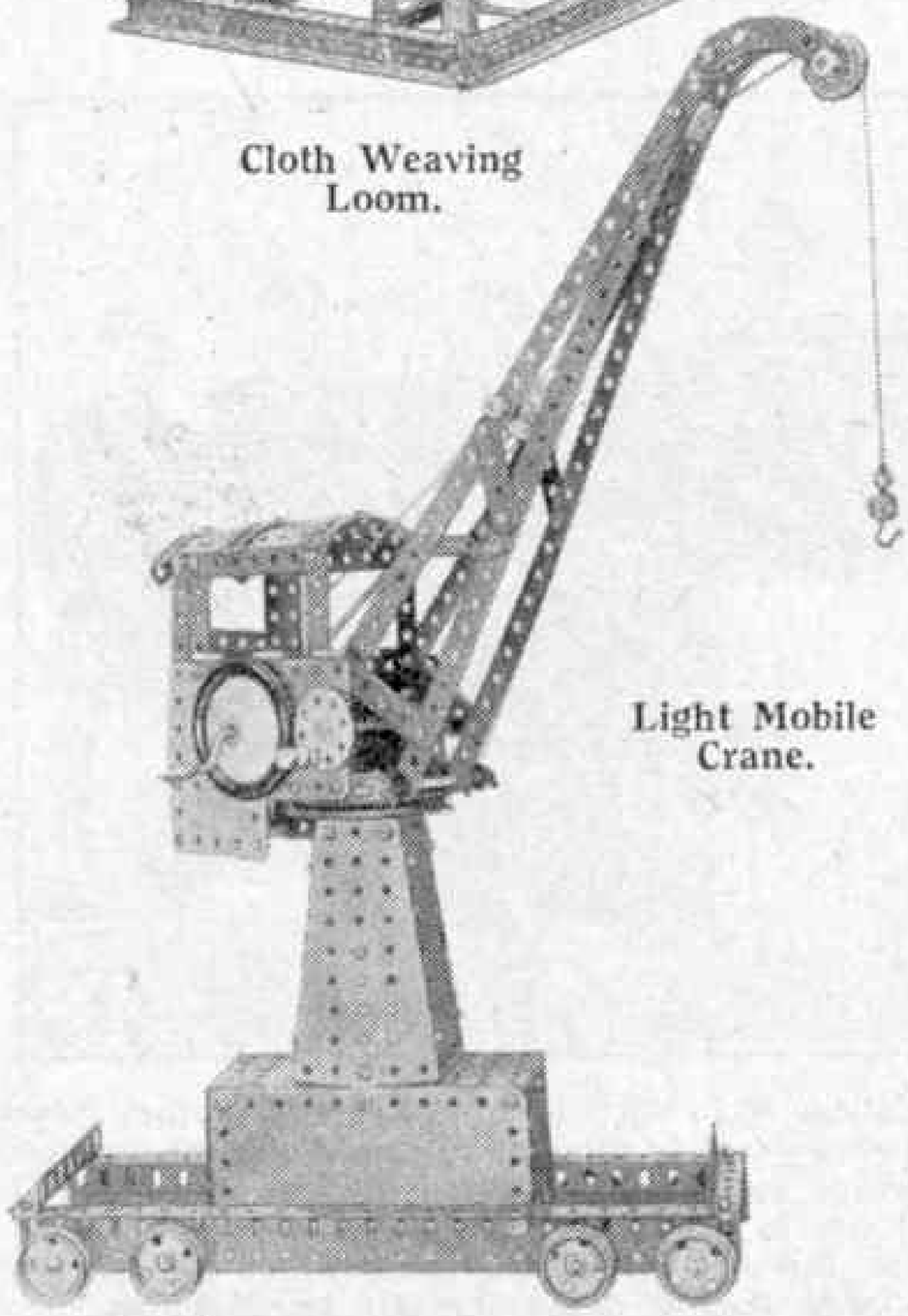
MECCANO MODEL-BUILDERS!



Old-Time Coach.



Cloth Weaving Loom.



Light Mobile Crane.

Every year thousands of new Meccano models are designed and built by boys all over the world. Meccano Ltd. wish to encourage these inventive boys, and with this object have planned a great International Model-Building Competition that is to be the largest Meccano Contest ever organised.

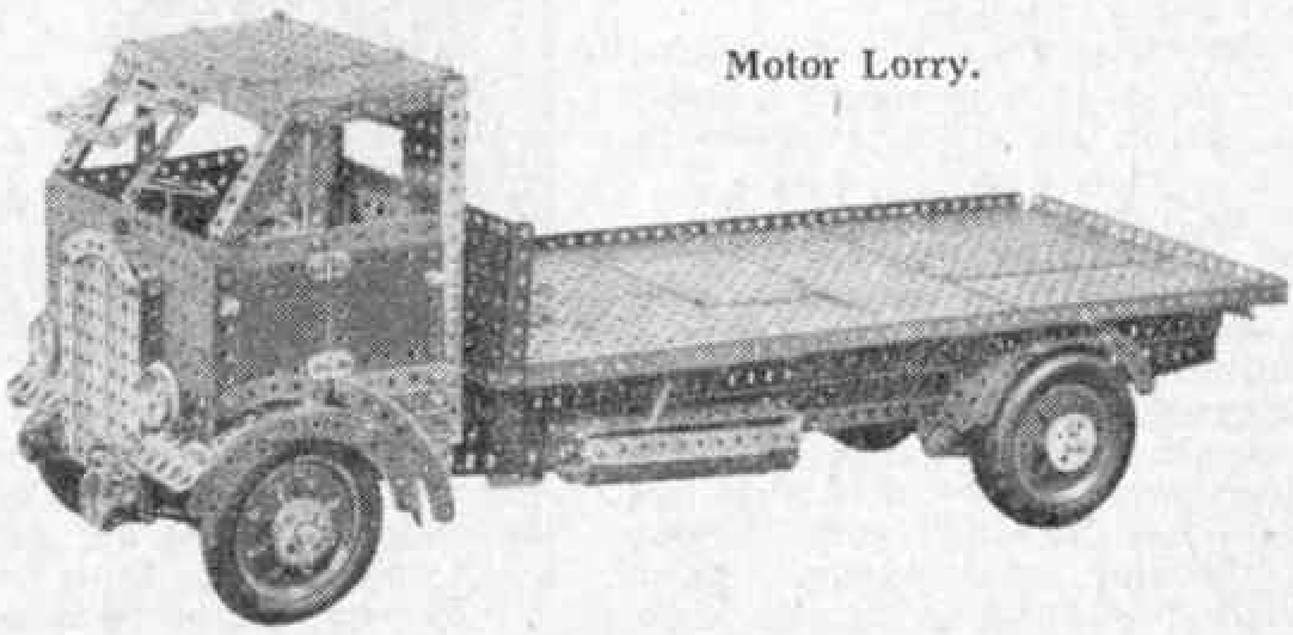
In this Contest a large number of Cash Prizes (total value £1,000) will be awarded for the best models submitted. It will be a world-wide Competition that will run throughout the coming Winter, and will be open to every owner of a Meccano Outfit, wherever he may live. There are no Entrance Fees, and the Competition is so organised as to give all competitors equal chances, irrespective of their ages.

FULL DETAILS NEXT MONTH

All the information you will need about this greatest-ever Meccano Competition will appear in the September *"M.M.,"* and every owner of a Meccano Outfit should make sure that he does not miss that issue. The announcement will contain a full list of the Prizes, and will give complete instructions for preparing and sending in entries.

You can build and enter a model of anything you like.

NOW IS THE TIME TO PLAN YOUR ENTRY



Motor Lorry.

Club and Branch News

WITH THE SECRETARY

PUT ON YOUR THINKING CAPS!

The preliminary announcement, on page 371, of the great 1952–3 International Model-Building Competition is certain to capture the attention of every enthusiastic Club member, and to make him eager for full details of this great event. He has only a month to wait, and in the meantime, whether he is on holiday at home, by the seaside or in the country, he can be thinking over the immense variety of subjects that can be reproduced in Meccano, and deciding the type of model that he will enter in this great Competition in the hope of winning one of the splendid prizes that will be offered.

So much for the individual Club member. News of even greater interest to Meccano Clubs is that there will be a special Section for models entered as Club efforts, that is, models built by the members working together as a team. Here is a marvellous opportunity for Club rivalry to express itself in the happiest terms, and every Club Leader should take advantage of it. What type of model shall be built and entered in this Section of the Competition might well be made the subject of a special Club meeting, at which all members can put forward their suggestions and ideas.

MECCANO CLUBS RECENTLY AFFILIATED

COLLEGIANS (CORK) M.C.—Mr. E. J. Boland, Collegians Social Club, 2, Summer Hill, St. Luke's, Cork.

SIR THOMAS RICH'S SCHOOL (GLOUCESTER) M.C.—Mr. N. J. Burrow, Sir Thomas Rich's School, Barton Street, Gloucester.

CAPE PENINSULA (S. AFRICA) M.C.—Mr. Z. A. de Beer, Box No. 719, Claremont, Cape Town.

FREEMANTLE DISTRICTS (W. AUSTRALIA) M.C.—Mr. H. E. S. Hamersley, 6, Bolton Street, East Freemantle.

WEST WOLLONGONG (AUSTRALIA) M.C.—Mr. Pagett, Eastern Avenue, Wollongong, New South Wales.

RECENTLY INCORPORATED BRANCHES

535—SOUTH YARRA (AUSTRALIA)—Mr. A. Bowling, 25, Lang Street, South Yarra, S.E.1, Melbourne, Victoria.

536—WELLS CATHEDRAL SCHOOL—Mr. G. Williams, The Cathedral School, Wells, Somerset.

537—ABBEY (CARLISLE) — The Venerable A. Chisholm, Archdeacon of Carlisle, 4, The Abbey, Carlisle.

538—MILE END (PORTSMOUTH)—Mr. A. J. Nicholson, 213, Sultan Road, Buckland, Portsmouth.

CLUB NOTES

JAMES STREET (EXETER) M.C.—Models built recently have included a locomotive, diesel-electric engine, footbridge with signals, two large revolving cranes and a tower wagon. Suggested new activities are Basket-Making and Stamp Collecting, and expert tuition has been offered to the Club. The Club room has been brightened by pinning on the walls the coloured front covers from issues of "*John Bull*." Club roll: 17. *Leader and Secretary:* Mr. M. C. Hodder, 3, Fords Road, Exeter.

COLLEGIANS (CORK) M.C.—This recently-affiliated Club is making good progress. It is hoped to hold an Exhibition early in September. Club roll: 20. *Secretary:* Mr. C. O'Neill, 1, Temple Lawn Flats, Blackrock Road, Cork.

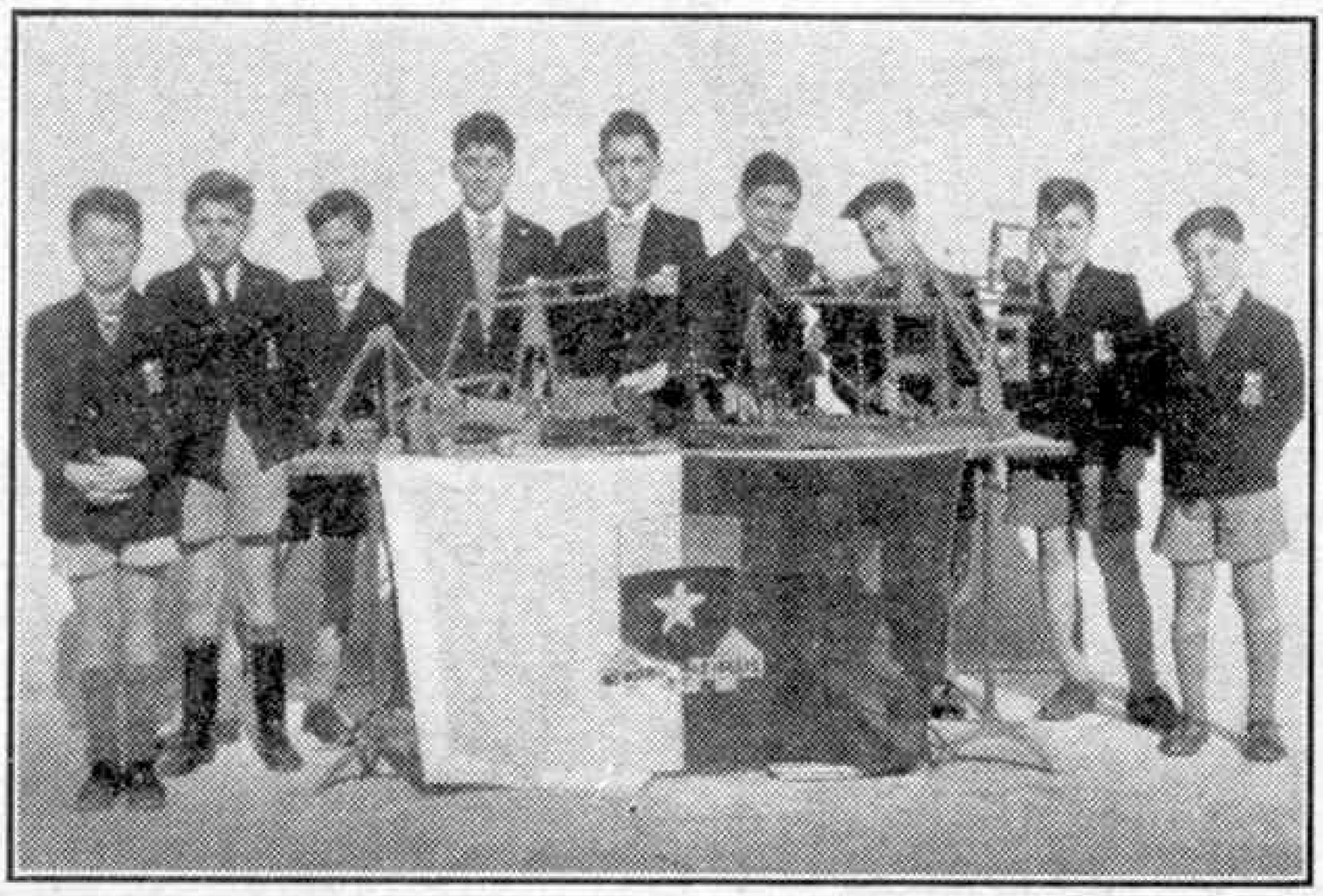
SIR THOMAS RICH'S SCHOOL (GLOUCESTER) M.C.—The Leader presented a member, D. Evans, with a No. 2 Meccano Motor as a prize for obtaining the most points during the previous session. General discussions have been held about Meccano and other matters, and Quizzes continue to be very popular. Club roll: 11. *Secretary:* Mr. B. R. Wiggall, 14, Sapperton Road, Gloucester.

HORNSEA M.C.—Cricket is being played one evening each week during the Summer. The annual Voting Session referred to in last month's "*Club Notes*" revealed a keen desire for Debates. Talks on Gardening are to be given. Club roll: 15. *Secretary:* D. Stevenson, 29, Southgate Gardens, Hornsea, E. Yorks.

BRANCH NEWS

REDLAND (BRISTOL)—Members enjoyed an outing to Saltford, a nearby village which has excellent boating facilities. More rails have been bought for the Hornby-Dublo layout. *Secretary:* Mr. P. B. Harper-Bill, 34, Chandos Road, Bristol 6.

NEW ROAD (SOUTH CHINGFORD)—An Exhibition attracted many visitors and was a great success. The main indoor activity lately has been the construction of the track for the Branch's "Chingford Day" layout. A visit to the "0" gauge layout of an old member of the Branch was greatly enjoyed. *Secretary:* Mr. E. Newman, 57, Harold Road, Chingford, London E.4.



Members of the Stella Maris College M.C. with some of the models they have built. This Maltese club is now very active, under the Leadership of Brother Aloysius and with the enthusiastic support of Brother Michael, Principal of the College. Models are displayed in a permanent showcase that is passed by all pupils several times a day, but a model of the Queen Mary constructed by one member was so large that it could scarcely be fitted in.

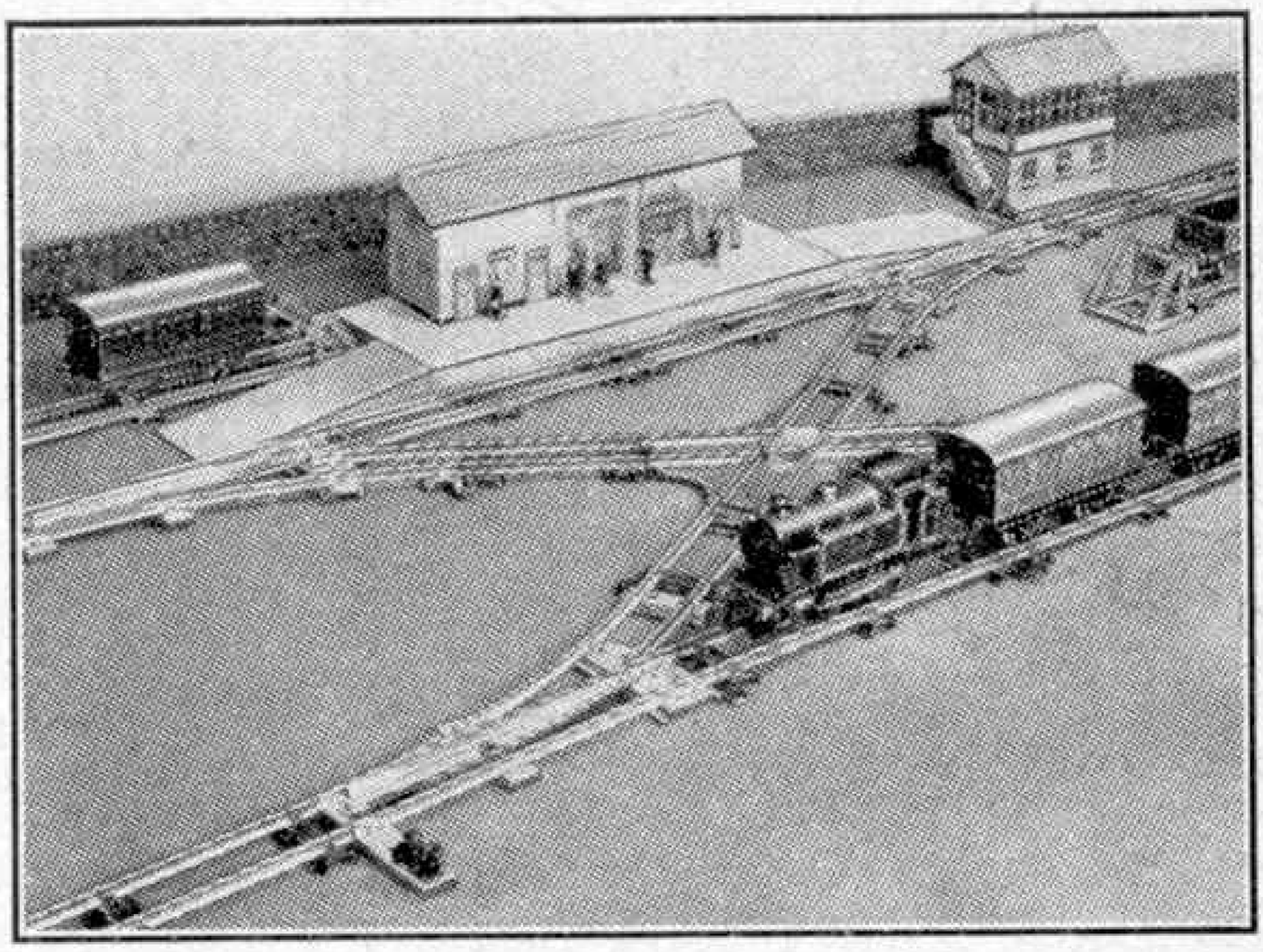
HORNBY RAILWAY COMPANY

Just Cross Talk

By the Secretary

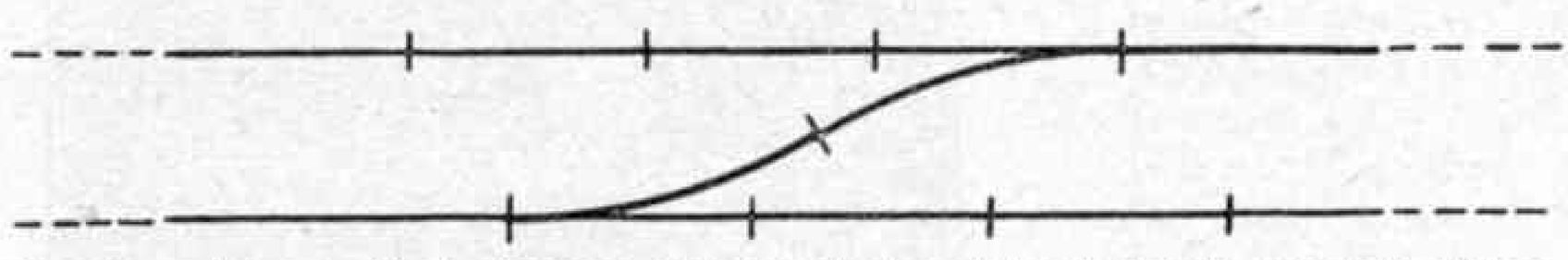
I SUPPOSE it would be easy to think out wisecracks about model railways to justify the title of my talk this month, but I leave that to other enthusiasts. What I am concerned with now is making one miniature railway track cross another. It is easy to manage this on a Hornby Railway, as both Acute-angle and Right-angle Crossings are available. Their inclusion in a layout makes for real fun—and excitement.

The first use to which a Crossing generally is put by the Hornby railway owner is to form part of what is known as a Figure 8 layout. There are several designs for layouts of this kind in the Hornby Gauge 0 booklet *Layouts for Clockwork Track*, and all are well worth trying out. On them trains run over the two tracks of the crossing in turn, a proceeding that is particularly attractive to younger Hornby railway owners and is a pleasing change from running trains round an ordinary circular or oval layout.



A Hornby scissors crossing made up from standard Rails, with an Acute Angle Crossing and four Points.

Crossovers from one track to the other of a double line also are interesting and easy to manage in a true railwaylike manner. The simplest crossover scheme is that shown in my diagram, where there are two Left-hand Points, one on each of two tracks, with their curved branches meeting end on. I have used two Left-hand Points to illustrate the fact that with this crossover trains can only change from one track to the other by reversing over the Points, if the usual rule of left-hand running is followed. If Right-hand Points were used instead the crossing could be made in the forward direction.



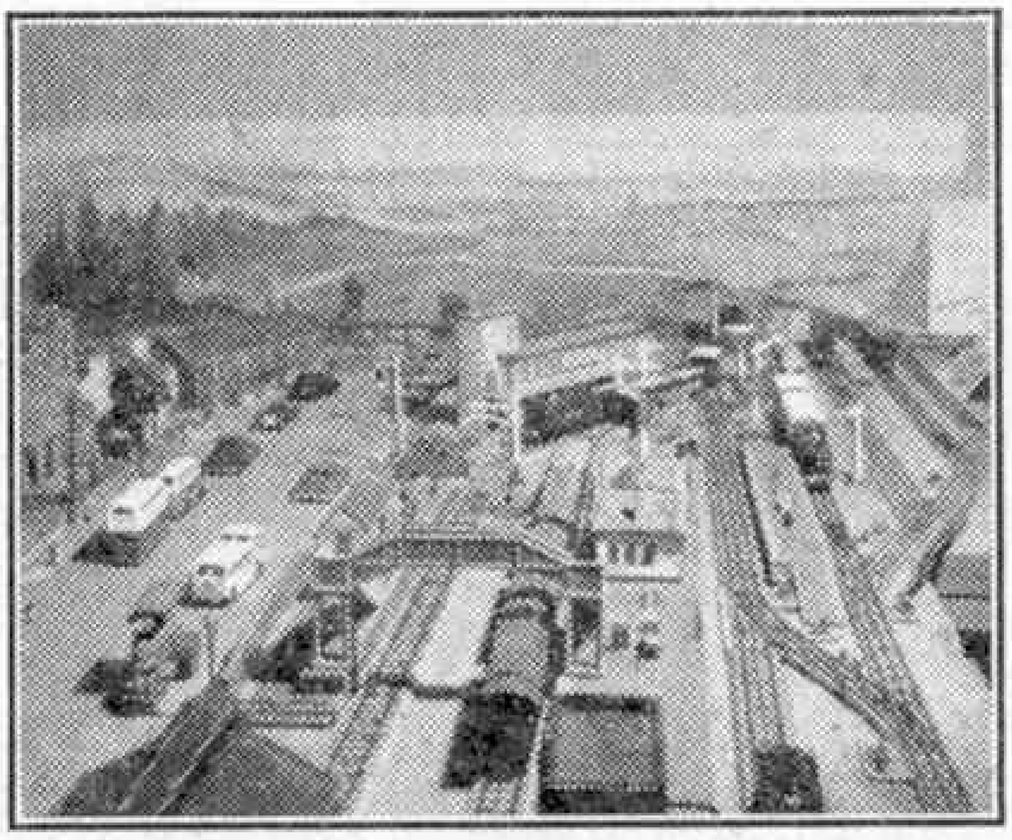
How to make a trailing crossover with standard Left-hand Points. The use of two Right-hand Points would have given a facing crossover.

With a trailing crossover following a facing crossover every kind of movement would be provided for. An arrangement of this kind requires a good length of straight track, however. If sufficient space is not available then the best thing to do is to build up a layout like that shown in my picture. Here there are four Points, two Left-hand and two Right-hand, and the Acute-angle Crossing connects the four ends of the curved branches. This arrangement takes up less room than the one already suggested, although of course the tracks connected must be farther apart. In effect it forms two crossovers in one, and the whole arrangement comes close to what in actual practice is known as a scissors crossing. Such a crossing can be used effectively to link up two separate ovals, or to join main tracks in the neighbourhood of a large station.

What about excitement? Well, if two trains are running on tracks that cross each other there is always a risk of their reaching the crossing together—but that should never happen with a Hornby Train enthusiast! I must have a talk about this with you some time.

This Layout Looks Real

A GLANCE at the pictures on this page shows that the layout concerned is unusually realistic in appearance. The Hornby-Dublo railway shown on them, that of K. W. J. Austin, Taunton, is clearly planned and lends itself to good



The main station on the Hornby-Dublo layout of Mr. K. W. J. Austin, Taunton, which is described on this page. Alongside the station is a well planned road suitable for Dinky Toys.

running, and it fits well into the general picture. From whatever direction one one looks at the scene, this is full but not overcrowded. Railway, road, buildings and background views blend splendidly to give the layout a real and distinguished appearance, yet it is only 9 ft. long and 4 ft. to 5 ft. wide.

At present the layout is roughly oval in shape. The main track is double throughout, but except at the principal station the two lines follow slightly different courses. The outer track climbs gradually from the chief station on to an embankment, where it passes through a tunnel, and it serves a wayside station. The inner one stays at baseboard level throughout, skirting the hill under which the outer track burrows.

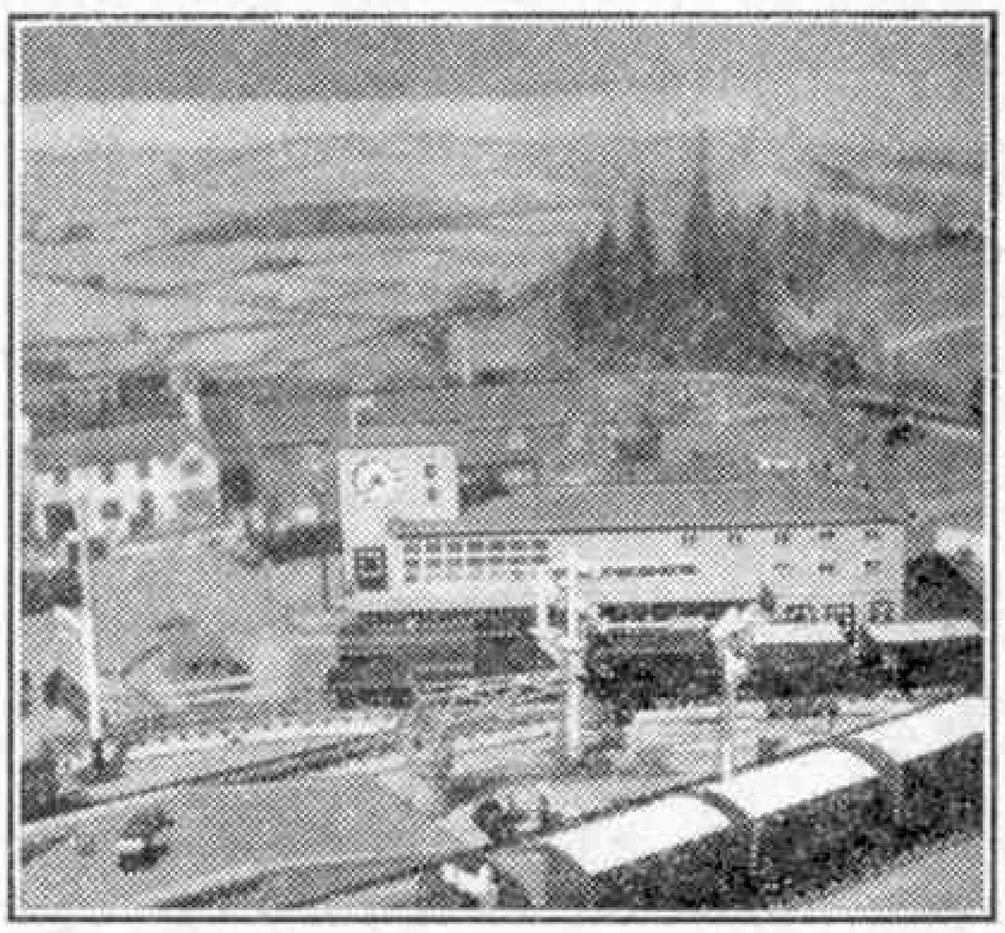
The two tracks are connected by crossover points, and there is a platform loop as well, so that running round operations are well provided for. In addition, there are both up and down sidings, with uncoupling and isolating rails at carefully chosen strategic points.

There is realism in operations as well as in the constructional work. The favourite workings are based on the actual timetables of the Barnstaple and Minehead branches from Taunton, and of course the stations on the layout change their names to suit the particular branch that is being followed. The passenger train is of three coaches, hauled by a *Duchess of Atholl*, and a standard Hornby-Dublo S.R. Tank also is at work, the fifteen goods vehicles on the line allowing for an interesting variety of goods trains.

The broad main street running alongside the principal station, and down the centre of the layout, is an excellent feature. Before reaching the station it passes under the raised outer track, and crosses the inner track on the level. Beyond the station it curves gently to the right, carrying traffic over the lines on a bridge. An excellent feature is that the Dinky Toys traffic on it has plenty of room in which to move. The proportions of both road and railway indeed have been very well thought out, and the two have a finely natural look about them.

The various buildings that face the main street have all been made at home. They include miniature shops, an hotel, a garage, a church and a school, besides an office block and ordinary dwellings.

Like all good railways, that of Mr. Austin is not yet complete. The owner has plans in his mind for adding an extension in the form of another oval system at right



Goods train operations in progress near the main station.

angles to the first, giving a layout of L shape, measuring 12 ft. by 12 ft. along its outer sides. The two main ovals will then form a complete system, with greater scope for engineering and scenic efforts.

One-Engine Running Schemes

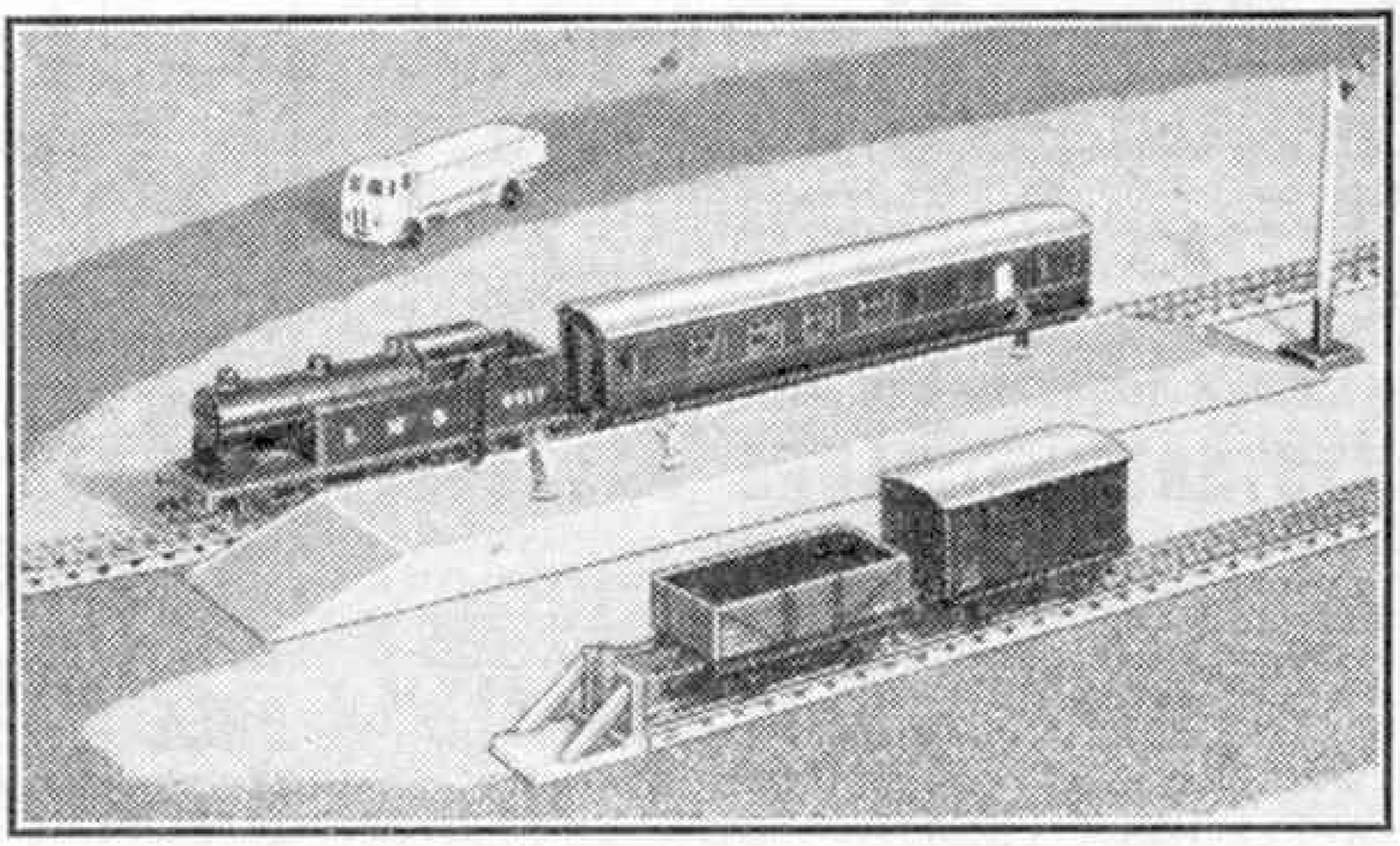
IT has often been remarked that it is not necessary to have an elaborate miniature railway system in order to carry out railwaylike operations. We all agree that "*Model Railroading is fun,*" and so it is, even on a simple layout.

Now many Hornby-Dublo railway owners have just a single Tank engine to carry out their train working. A plain oval track allows us to "exercise" our engine and its train, and once a siding and perhaps one or two accessories are added the layout begins to grow into a railway. A tank engine layout worked on the "one engine in steam" principle may not suggest a main line, with express trains roaring along it. But it will closely resemble many of the lesser routes of actual practice!

A continuous layout is usually preferred for one-engine systems, because it allows longer runs than might be possible with an end-to-end track in the same space. This helps to keep things generally simple, as one siding, or perhaps two at the most, will be all that is required.

We must have a station, of course. A Hornbly-Dublo Through Station or Island Platform can be used to advantage for the principal station, but a plain wooden platform can be used to represent a simple intermediate halt. The train can be a one-coach unit powered by the familiar Hornby-Dublo Tank and such a combination will do very nicely for a push-pull service such as is used on many minor routes today.

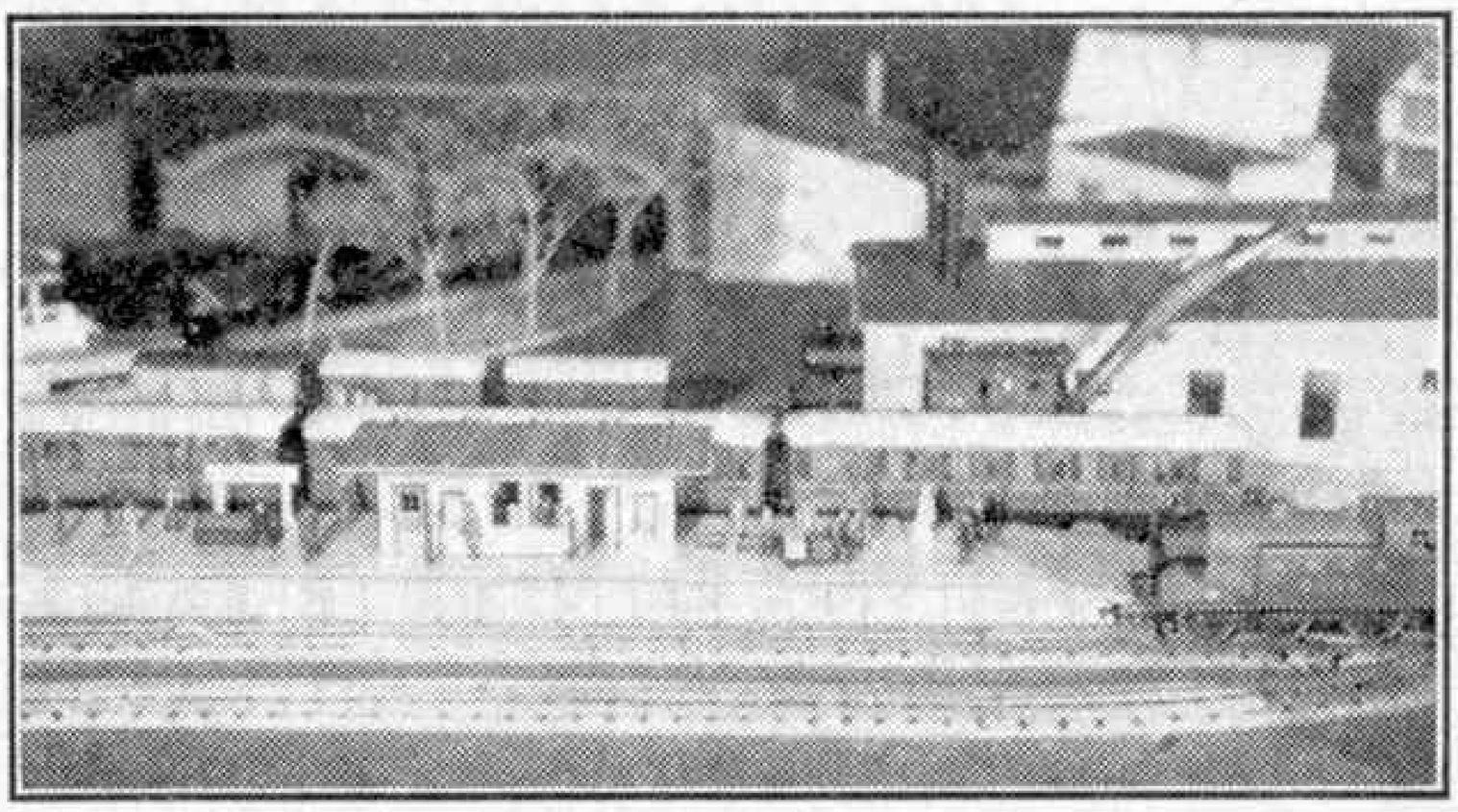
As the system develops the scope of operations can be enlarged, to give perhaps a typical piece of "outer suburban" working, as has been done on the layout of Mr. C. M. Hare, of Ottawa, seen in part in our lower illustration. There the Tank engine, uncoupled from one end of its train, is running round in order to hook on to the other end ready for the return journey.



A simple halt with a plain platform. The Tank Locomotive and its single Coach provide a branch line service.

There is no need to concentrate on passenger train working alone. If there are even a few Wagons and a Goods Brake Van in our equipment, fascinating goods working can be carried out in between the passenger train runs, and "mixed" trains too, made up of coaches and wagons, can be run, as they are sometimes on branch lines.

A regular goods train for some particular traffic, perhaps cattle, or perishables, can be included in the operating arrangements as long as we have suitable vans available. Such workings occur in real practice, and may be intensive at certain seasons.



"Running round" in progress on the Hornby-Dublo layout of Mr. C. M. Hare, Ottawa. Our photograph was taken by Mr. F. Blakeney.

BARGAIN DISCOUNT APPROVALS!

Grand selections of picked stamps, mint and used, yours for the asking. (We pay postage one way). Generous discount allowed. "Wants" lists of individual stamps (NOT countries) welcomed. These are the REAL collector's approvals and there's no obligation to buy. We offer "Adult Service for Junior Collectors."

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Send 3d. post, request approvals containing U.P.Us., Weddings and latest commemoratives.

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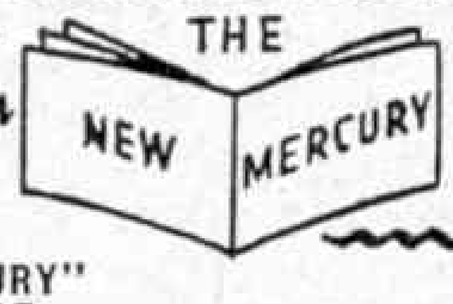

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Write to-day to:

CAPT. M. CAMPBELL & CO. (Dept MM)
58, High Street, Watford, Herts.

FREE—24c K.G. VI TRINIDAD

This scarce high value stamp will be given free to all genuine applicants for our famous ONE PENNY APPROVAL BOOKLETS of BRITISH COLONIALS. These Booklets abound with JUBILEES, CORONATIONS, VICTORY, Bi-COLOURED PICTORIALS and the latest K.G. VI stamps. The best value on the market. N.B. Enclose 2½d. stamp for Postage.

S. FENLEY LTD., 250, Charminster Rd., Bournemouth

FREE!! ST. KITTS-NEVIS NEW ISSUE

Short set from this West Indian Colony will be sent to all sending 2½d. postage for my **50% DISCOUNT APPROVALS.**

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J. THOMPSON, 42, BOURNEMOUTH ROAD, BLACKPOOL

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Large Airmail Pictorials SHOWING AIRLINER & SWALLOW—FREE!—

3 SILVER WEDDINGS FREE Send 2½d. for my latest approvals.

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Also latest **Virgin Is.** All **Free** to collectors asking to see our famous "Quality" approvals. Send 3d. to cover our postage and lists. **If** you wish, you may join **"THE CODE STAMP CLUB,"** Sub. 1/-. You receive **Badge,** Membership Card listing **fine gifts** and "Quality" approvals monthly. (Gifts include full-size Tweezers, etc.).

WRIGHT'S STAMP SHOP, (M34), Canterbury, Kent

For other Stamp Advertisements see also pages 378 and xvi.

Stamp Collectors' Corner

By F. E. Metcalfe

ST. KITTS-NEVIS

HAS the new St. Kitts set arrived yet? That is how a collector referred to the new stamps that the authorities would describe as a set of postage stamps for "Saint Christopher Nevis Anguilla"; at least that is the description given on the stamps themselves. The collector's face lit up when he was shown the very handsome new set, but more about that later on.

St. Kitts—let us call it that, like everyone else—has had quite a colourful philatelic history. Three islands are concerned, St. Kitts—or St. Christopher, take your pick—Nevis and Anguilla, and together they form one of the Presidencies of the Colony of Leeward Islands. St. Kitts has an area of 68 square miles and a population of about 29,000. Nevis with its area of 50 square miles maintains a population of 15,500 or thereabouts, and Anguilla with 35 square miles has a population of barely 5,000. There are one or two more islets scattered about, and the capital of them all is Basseterre.

As is to be expected, the chief exports are sugar, sea-island cotton and of course postage stamps. Oh and by the way, there is quite a nice mountain by British standards, Mount Misery, which is 3,711 feet in height. Don't let us screw our noses up at that, with Mount Everest so much in the news, for after all we have nothing quite as high in England or Wales. We first poked our noses into Nevis and St. Kitts as long ago as 1623, and 90 years later, by the Treaty of Utrecht, we managed to gobble the rest of the territory, and there we remain. Now all can breathe freely again, for that is all the geography and history that I propose to inflict on any readers who have ploughed through so far as this. Now for the stamps.

Nevis was the first of the islands to have stamps, and these appeared in 1861. They bore the design of the island's badge, which shows a medicinal spring. In 1879 the design was changed for a simple head portrait of Queen Victoria. St. Kitts made its philatelic début in 1870. The same portrait of the Queen was used, and there was a good deal of surcharging done—some of these stamps are very valuable—and even revenue issues were used postally.

In 1890 all the stamps of Nevis and St. Kitts were withdrawn and those of the general issue of Leeward Islands substituted, but in 1903 we got the set titled St. Kitts-Nevis. Two designs were concerned, first, that already described for Nevis and second the badge of St. Kitts. The latter has caused a lot of amusement, for it shows Christopher Columbus with a telescope. Of course there were no such instruments when Colon first sailed, but don't blame the stamp designers for the gaffe, as so many philatelic writers do, for they merely adopted the old badge of the colony itself. In 1920 large sized oblong stamps appeared, with the portrait of King George V and the ubiquitous badges of the two islands. Once again poor Colon was shown in the impossible position with the telescope.

The next set caused quite a scandal. The postal authorities were honest enough to tell a little more of the truth than is usually revealed by such bodies. St. Kitts wanted a sports ground, mostly for cricket, of course, being good West Indians, and there was only one way to raise the wherewithal—the issue of a set of postage stamps. All would have been well, and sufficient funds for another Lords or even Old Trafford would have been raised, but for the authorities saying what the purpose was behind the issue. If there is one thing that stamp collectors know, it is that all these pretty stamps are merely call birds for their cash. But just as you cannot catch that three-pound trout if you show the bait, you cannot get that money if you let the collector see the works. The stamps were virtually boycotted, and today a set costs a lot of money in consequence.

We had a new set for King George VI, with designs virtually as before, and only on 15th June did we get a set in the new West Indian currency. A delightful set it is too. Gone has poor old Colon, with his telescope, as well as the medicinal spring. Instead we have 12 values, nine of which are bi-coloured and three of single colours, to conform with U.P.U. directions. Although all the designs are different, even the schoolboy collector will be able to get a representative set if he is willing to spend a couple of shillings. A full set has a face value of about £2.

I must admit that I have spent quite a pleasant half hour studying the pictures on this handsome set. The 3c. stamp gives us a clear map of all the islands and perhaps will be the most popular one, for map stamps are in great demand by the "thematics." Don't blame me for that horrid word, they use it themselves. The 12c. shows us the tomb of Sir Thomas Warner, the first governor. On the 60 c. we get a picture of a surprisingly handsome building, the Treasury at St. Kitts. Warner Park comes on the 2c., on the 1c. we get the Bath House at Nevis, and the other values are devoted to views and island activities.

My favourite stamp in the set is the 5c. The centre shows Nevis from the sea. Just examine that stamp—I am glad it is of low face value, for thus all can afford a copy. Note the beauty of the engraving. Don't overlook that light and shade, and remember that it is engraved, with all that that implies.

A final point. This set will have a very short life, so make sure of your copies while they are current, and at the same time be very pleased that the authorities are providing us with such gems to collect.

SEASIDE HOLIDAY STAMP FREE

ABSOLUTELY FREE. If YOU write and ask to see a Selection of Windsor Stamps on Approval, the Windsor Stamp Co. will send to **YOU** this most desirable stamp **ABSOLUTELY FREE.** It is a large handsome stamp issued by **HUNGARY,** and as you can see shows the head of a Child and a Children's Holiday Beach Scene complete with sand-castle, watering-can and beach balls. It is an unusual stamp which will add lots of interest and value to your own collection. To obtain it just write for **Seaside Stamp Free** and ask to see a **Selection of Windsor Stamps on Approval;** enclose 2½d. stamp for postage to you and post without delay addressed to:

WINDSOR STAMP CO. (Dept. M) UCKFIELD. SUSSEX

UNUSED NEW ZEALAND

A fine unused set of New Zealand Victory stamps showing Lake Mathieson, King Geo. VI and Parliament, and St. Paul's Cathedral with the Union Jack in the background, a quotation from one of Mr. Churchill's great Battle of Britain speeches and the V sign, designs truly symbolising the sources of Peace, Strength and Victory, sent free to all applicants for approvals enclosing 2½d. postage. Mention M.M.

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to every applicant for approval books. The GIFT contains 30 British Colonials including 8 K.G. VI mint—no Great Britain. Good discount is given and a list of 98 Gifts is sent. These can be chosen by you and vary in value according to the money sent for purchases. They include K.G. VI Silver Jubilees; ALL the Colonial Victory sets mint; and Foreign stamps. 3d. postage please.

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5/- Post Free **DEALERS MIXTURE off Paper** **5/-** Post Free

Approximately 1,000 (Weighed) UNSORTED mixture. Good variety of old and new issues from numerous sources of supply. Constantly changing in contents. Abroad postage 1/- extra.

JOS. H. GAZE, 10, Pimlico Road, CLITHEROE, Lancs.

FREE! This beautiful centenary stamp of Barbados FREE to all asking for our famous approvals and enclosing 3d. stamp.

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120 USED U.S.A. COMMEMORATIVES. S.G. Numbers 1/6 for 12. Postage extra

373, 375, 472, 831, 863AA, 878, 881, 882, 904A, 906, 907, 908, 909, 917, 918, 919, 921, 922, 927, 929, 932, 936, 937, 944 to 948, 981, 986, 987, 994, 995, 999, 1000, 1004, 1005, 1009, 1010, 1014, 1015, 1019, 1020, 1039, 1039A, 1072, 1077, 1078 to 1094, 1098 to 1104, 1106, 1108 to 1131, 1133, 1134, 1135, 1140 to 1161.
S.G. 1952 U.S.A. 81 page Catalogue, 2/9.

FRED HARLOW 2, ROBYNS WAY, SEVENOAKS, KENT

NO CUSTOMERS WANTED

During August no new customers are wanted. Holidays and large orders for approvals make this announcement necessary. Look out for a very special offer for September, however, when you will be given another opportunity to become a satisfied customer.

H. B. LANG
BURNBANK, MAUCHLINE, AYRSHIRE

FREE! Three New Stamps for St. Kitts

Only just issued—1 map stamp and 2 different views of St. Kitts, all three in brilliant mint condition. These will be sent **FREE** to all enclosing 2½d. for postage and asking to see a selection of our discount approvals.

Write immediately to:

GEM STAMP CO.
514, FAIRFAX DRIVE, WESTCLIFF, ESSEX

Special offer of Rex Catalogue of King George VI Stamps Free. Over 450 illustrations: 6,600 Prices, with almost 150 pages.

Simply request my discount approvals and enclose sixpence in stamps to cover postage and packing.

J. H. Abel, 53, Green Close, Sturminster Newton, Dorset

100 DIFFERENT STAMPS FREE

(including TRIANGULAR and PICTORIALS)

To Approval Applicants enclosing 2½d. postage.

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AMAZING FREE GIFT SCHEME!

Send 2½d. for details and approvals. **YEOMAN, 18, Devon Road, Hersham, Walton-on-Thames, Surrey**

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JERSEY MINT SET 1943, ½d., 1d., 1½d., 2d., 2½d., 3d., also 1948 1d., 2½d. These 8 scarce stamps for 7/6.

HILLIER, 35A, NORTHDOWN AVENUE, MARGATE

FREE—STAMPS CATALOGUED 5/-

to applicants for ½d. approvals.

COX, 17, STONELEIGH PARK ROAD, EWELL

For other Stamp Advertisements see also pages 376 and xvi.

Stamp Gossip

RED CROSS STAMPS

BRITISH collectors seem to dislike overprinted stamps, an unaccountable antipathy, because from a financial standpoint they more often than not have distinct possibilities, but they go to the other extreme over stamps that have anything to do with the Red Cross. The latest "Red Cross" issue from Japan therefore is sure to be much sought after, and as the face value is low, practically all collectors will be able to indulge in a set.

There are two stamps. These are the 5 yen, depicting the Lilium auratum, with the Red Cross in the background, and the 10 yen with a portrait of a Japanese Red Cross nurse. The designs are in the usual good taste of the country that has issued them, and their object, apart from a gentle tug at collectors' pockets, is to commemorate the 75th anniversary of the founding of the Japanese Red Cross.

HAPPY EVENT

Egypt has been at it again, and another really attractive stamp is the result. The event commemorated is the birth on 16th January of the heir to the Egyptian throne, the Crown Prince Ahmed Fuad. The date of issue of the stamp was 6th May and besides the stamp itself a miniature sheet was released. There was the usual rush to buy, and according to stories that have been circulated, it was very difficult to get a copy in the post office. But dealers have had no trouble and in England a copy costs something under a shilling, while the miniature sheets cost about twice as much.

CROWN AGENTS' RELEASES

A reader new to the hobby has written to ask what are Crown Agents' releases, about which he has read so much in the stamp magazines. It is obvious from other letters that quite a few new collectors are interested in the query, so a few words about the Crown Agents in general, and their releases in particular, may not be out of place.

It will be known generally that when new Commonwealth stamps are issued—this does not apply to the Dominions, which handle their own issues exclusively—supplies are put on sale not only in the country concerned, but also at the offices of the Crown Agents in London. What may not be known as generally is that not only are entirely new stamps released in London, but new printings of existing stamps as well. These latter are known in the trade as Crown Agents' releases.

I can imagine some prudent collectors saying that instead of paying a dealer a price over face value, why cannot they buy at face direct from the Crown Agents themselves? The answer is that only dealers on the approved list are supplied, and it is difficult to get on that list. Moreover, not only must dealers pay a premium of ¼ per cent., but the minimum commission is 10/–, so even if a collector were allowed to buy, it would hardly work out cheaper if he had to pay 10/– over the face value of his set. Of course a dealer can absorb the 10/– when he buys say £200 worth of stamps—he often buys a whole lot more than that—but the commission on the new printings is certainly a bugbear, when perhaps only a shilling's worth of stamps are concerned.

Here is one instance of what can happen. A few months ago a new printing of the 2d. and 3d. stamps of British Solomons was announced. Most dealers did not expect any change, and when the two stamps were received on the Saturday morning, even where a perforation change was noted, few dealers did anything about it until the following Monday. Alas for the laggards! When they did apply, the answer they got was "sold out," and within a week or so those early birds who got supplies were selling the 2d. and 3d. values at up to 12/6d. a pair. Later stock was received from the colony in the same perforation, but by then many collectors had paid a big price.

The Crown Agents have now opened an office in Washington, U.S.A., for the sale of stamps. While they have not done very big business up to the present, prospects are bright, for American collectors are going for our issues in a big way.

MONA LISA

It had to come sometime, the most famous painting in the world depicted on a postage stamp. Western Germany seized a very appropriate occasion, by issuing the stamp in celebration of the 500th anniversary of the birth of Leonardo da Vinci, perhaps the greatest genius of all time and the painter of the picture that figures on the stamp. Fortunately this can be bought for under a shilling, and the sale cannot help but be enormous. One job that I would not like, however, is trying to describe the colours for the catalogue.

HOLLAND

The annual Summer Charity Issue appeared on 1st May. There are five stamps in the set, each one showing a common flower. While they will be popular, for there is a great vogue just now for flower stamps, it cannot be said that the stamps are in the same street as those issued recently by Hungary and particularly Austria. Yet they will sell all right, but I do wish the colours had not been so garish.

The one illustrated shows a tulip, a flower which we associate closely with Holland. Yet it is Turkey that claims this flower as its own. It is not only their national flower, but the Turks tell us that it originated in Turkey. I can well believe it. I would believe anything about that country, in the flower line, for I once saw almost a whole valley carpeted with red tulips, another with huge drifts of Christmas roses and a third with large patches of muscari, all growing wild.

Competitions! Open To All Readers

Prize-winning entries in "M.M." competitions become the property of Meccano Ltd. Unsuccessful entries in photographic, drawing and similar contests will be returned if suitable stamped addressed envelopes or wrappers are enclosed with them.

Passenger Trains This Time

Here is another railway contest on the lines of that in our June issue. Passenger trains do not as a rule give us much time to observe their different features as they run past us at the lineside. Still, they can be seen at rest at stations, whereas goods trains have an annoying habit of standing just where we cannot get near them!

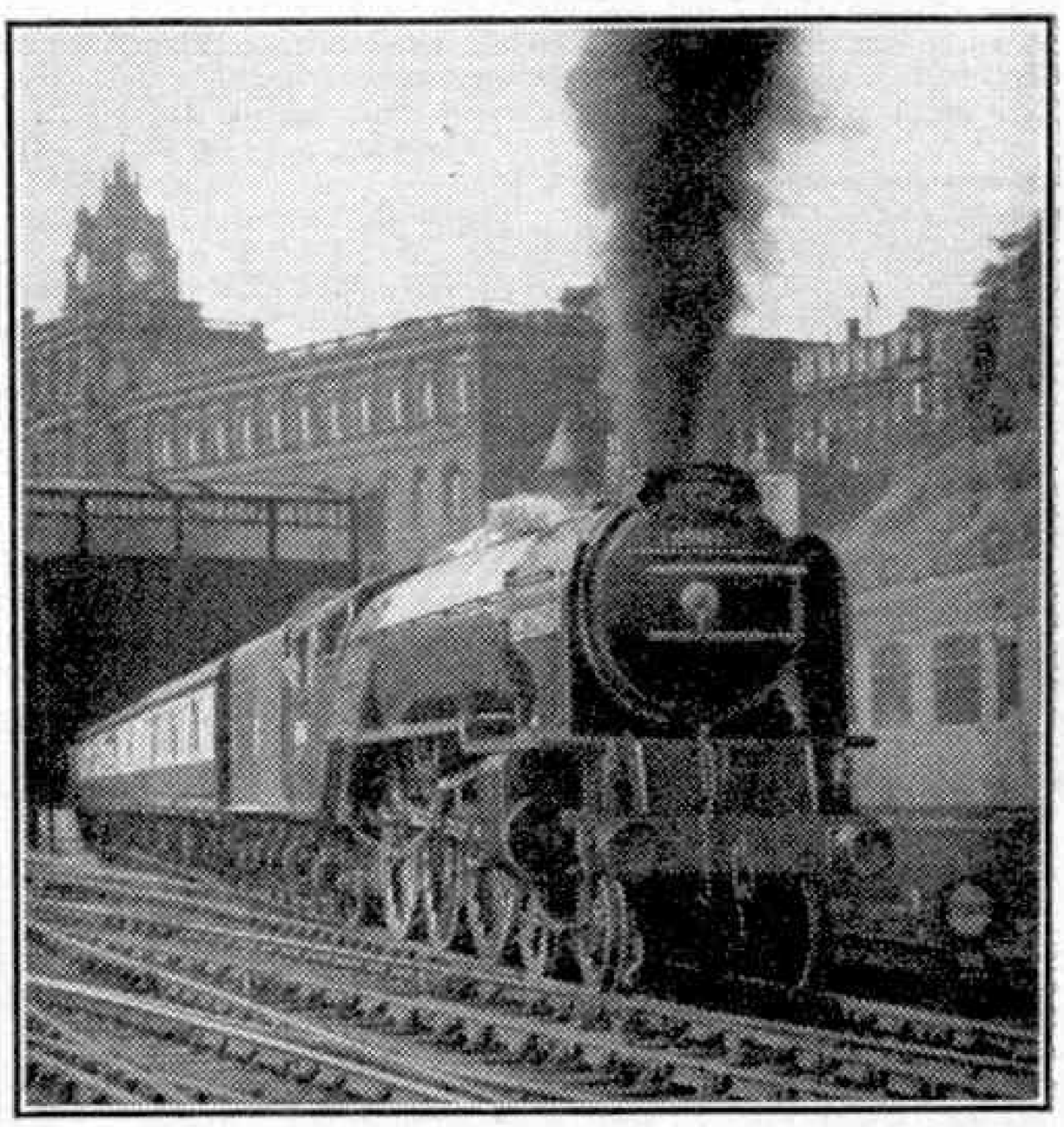
This month then we give readers a fine picture of a passenger train *The Heart of Midlothian*, which runs over the tracks of three Regions of British Railways in its flight between the Scottish and English capitals. This will serve as a guide in their search for some at least of the answers to the following 10 questions, all relating to passenger train matters.

1. How do you know if a train is an express?
2. What is a "set train?"
3. Where in Britain can coaches marked "second class" still be seen?
4. What does a star on a coach solebar indicate?
5. What is indicated by a yellow square painted on a passenger brake van?
6. What is a motor train?
7. What is a dual fitted vehicle?
8. What is a composite coach?
9. What is an articulated set?
10. Which railway in Britain uses converted goods brake vans for the conveyance of passengers?

Entries should be made as concise as possible, and of course must have on them the full names, ages and addresses of the competitors. They should be addressed *August Passenger Train Quiz, Meccano Magazine, Binns Road, Liverpool 13.*

As usual there will be two sections, for Home and Overseas readers respectively, and in each prizes of 21/–, 15/– and 10/6 will be awarded for the best entries, with consolation prizes for other good efforts. If there is a tie for any prize the judges will take neatness and novelty into account.

Closing Dates: Home Section, 30th September; Overseas Section, 31st December.



Departure! "Saint Johnstoun" draws out of Edinburgh (Waverley) on "The Heart of Midlothian" Express. Photograph by the Ven. Eric Treacy.

What Aircraft Are These?

The cycling story told in the next paragraph will appeal specially to readers who are aeroplane enthusiasts, as each jumbled word hides the identity of a current type of British or American aircraft. We invite readers to discover the hidden names and to make a list of them, adding in each instance the nationality of the machine, maker's name and the duty or duties for which the aeroplane has been designed.

Three **Rfoodx** boys, named **Ngetna, Ranzboba** and **Cintrepe,** went on a cycling tour. Near **Nloclni** they stopped at an airport where they saw **Knigvi, Hirgrefte and Rahomnat** aircraft, and were introduced to **Gistansh,** the pilot of a **Tinslecantolo,** and his friend **Ptocrro,** a **Sehrem** pilot. As they rode on, **Tromee** aircraft passed overhead, and once they saw a **Thenru. A Twfis** run soon brought them to **Recarnab** Castle where, it is said, a **Cnperi** and **Sneprcsi** once were imprisoned by an anti-Royalist **Ctnuvosi** named **Kyro,** reputed to have been a **Rocutata** and **Tenmitra.**

As usual the contest is in two sections, one for Home readers and the other for readers Overseas. In each of these sections there will be prizes of 21/–, 15/– and 10/6 for the three best entries in order of merit, and if necessary the judges will take the neatness and originality of presentation into account.

Entries should be written on one side of the paper only, and addressed *August Aircraft Contest, Meccano Magazine, Binns Road, Liverpool 13.* Closing dates: Home Section, 30th September; Overseas Section, 31st December.

August Photographic Contest

The eight of our 1952 series of photographic contests is a general one in which we invite readers to submit prints of any subject. Each competitor may submit only one photograph, which must have been taken by him, and on the back of his print must be stated exactly what the photograph represents; also his age must be given.

The competition will be in two sections, A for readers aged 16 and over, and B for those under 16. Each competitor must state in which section his photograph is entered. There will be separate overseas sections, and in each section prizes of 21/–, 15/– and 10/6 will be awarded. Entries should be addressed *August Photographic Contest, Meccano Magazine, Binns Road, Liverpool 13.* The closing date in the Home Section is 30th August, and in the Overseas Section, 29th November.

Competitors who desire their entries to be returned should note the paragraph at the top of this page.

Competition Results and Solutions

HOME

MARCH 1952 CROSSWORD PUZZLE

1st Prize: N. F. Cryer, Bath. 2nd Prize: R. H. McDougall, Perth. 3rd Prize: J. B. Millburn, Harpenden. Consolation Prizes: A. H. Jones, Wallasey; B. B. Smith, Ipswich; K. Brownlie, Exeter; B. H. Dunham, Norwich.

MARCH 1952 AIRCRAFT CONTEST

1st Prize: R. Storey, Ware. 2nd Prize: R. Sheppard, R.A.F., Lytham St. Annes. 3rd Prize: N. Eakins, Liverpool 19; Consolation Prizes: D. Evans, Caterham; G. Davis, Salisbury; B. L. Jones, Caterham; D. Hounsell, Long Bredy.

APRIL 1952 PHOTOGRAPHIC CONTEST

1st Prize, Section A: R. O. Fordy, Camberley; Section B: I. Bell, Chepstow. 2nd Prize, Section A: S. S. Pethybridge, Newton Abbot; Section B: P. E. Haynes, Redhill. 3rd Prize, Section A: C. E. Wrayford, Newton Abbot; Section B: K. B. Foot, New Milton. Consolation Prizes, Section A: J. H. Wigston, London N.W.11; J. Hampson, Farnborough; J. Bland, Edgware; R. H. Weeks, Holmrook; Section B: R. Hicks, Horrabridge; A. R. A. Maclachlan, Leamington Spa; J. Warren, Shrewton.

OVERSEAS

NOVEMBER 1951 MODERN INVENTION CONTEST

1st Prize: L. Clare, Bray, Irish Republic. 2nd Prize: H. Rokaft, Ler, Norway. 3rd Prize: A. Doig, Somerfield, N.Z. Consolation Prizes: G. F. Levett, Milford, N.Z.; W. Hassett, Grahamstown, Australia; M. George, Melville, Australia.

NOVEMBER 1951 LOCOMOTIVE CONTEST

1st Prize: P. G. Langley, Stockholm, Sweden. 2nd Prize: B. Hewson, Ghent, Belgium. 3rd Prize: L. G. Poole, Melbourne, Australia. Consolation Prizes: D. J. R. O'Shea, Kenmare, Irish Republic; J. P. Clarke, Tunis, Tunisia; W. Blake, Blenheim, N.Z.

NOVEMBER 1951 PHOTOGRAPHIC CONTEST

1st Prize, Section A: W. M. Dobson, Bahia, Brazil; Section B: E. Pearse, Newcastle, Australia. 2nd Prize, Section A: T. Chitty, Johannesburg, S. Africa; Section B: H. B. Smith, Maynooth, Irish Republic. 3rd Prize, Section A: P. B. Barker, Madrid, Spain; Section B: G. E. Beavan, Geraldine, N.Z. Consolation Prizes: D. H. Tomkinson, Vancouver, Canada; H. Arnold, Dublin, Irish Republic; A. Jenks, Gibraltar; A. K. Richardson, Berne, Switzerland; T. McPherson, Brussels, Belgium.

DECEMBER 1951 PHOTOGRAPHIC CONTEST

1st Prize, Section A: K. Swale, Bombay, India; Section B: J. Skelton, Yarram, Australia. 2nd Prize, Section A: S. J. Williams, Rotterdam, Holland; Section B: P. M. Smith, Salta, Argentina. 3rd Prize, Section A: C. J. Henderson, Hastings, N.Z.; Section B: R. Thompson, Southampton, Bermuda. Consolation Prizes: T. N. Smith, Capetown, S. Africa; B. Taylor, Kitwe, N. Rhodesia; R. Lubeseder, Alberta, Canada; G A. May, Potchefstroom, S. Africa; P. McCullen, Drogheda, Irish Republic; B. Natarajan, New Delhi, India.

DECEMBER 1951 CAR FACES CONTEST

1st Prize: R. G. Milldemass, Dunedin, N.Z. 2nd Prize: A. Murphy, Templeogue, Irish Republic. 3rd Prize: M. R. Hindson, Lusaka, N. Rhodesia. Consolation Prizes: L. G. Alley, Durban, S. Africa; W. McQuarrie, Invercargill, N.Z.; C. Kemp, Dromana Australia.

JANUARY 1952 PHOTOGRAPHIC CONTEST

1st Prize, Section A: J. Bellis, Rosario, Argentina; Section B: M. J. Potter, Nice, France. 2nd Prize, Section A: Bro. Victor, Gzira, Malta, G.C.; Section B: M. Boswell, Inglewood, N.Z. 3rd Prize, Section A: J. Sexton, Limerick, Irish Republic; Section B: M. Ware, Istanbul, Turkey. Consolation Prizes: J. Vella, Mosta, Malta, G.C.; A. P. Biswas, Birbhum, India; C. Vella, Mosta, Malta, G.C.; U. M. de Lanerolle, Colombo, Ceylon; P. R. Bland, Portarlington, Irish Republic; D. Falconer, Toronto, Canada.

SOLUTIONS

SEPTEMBER 1951 TRACK CONTEST

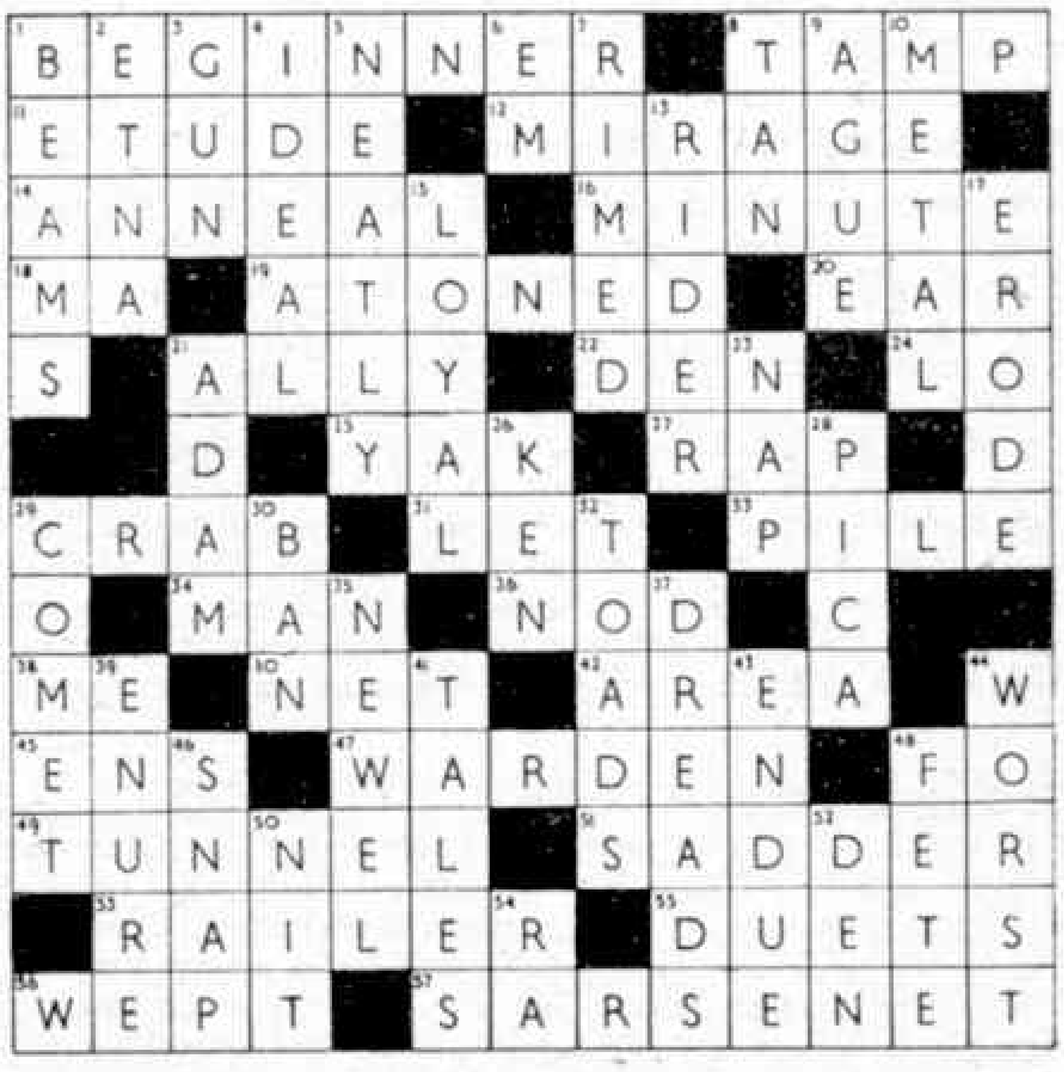
1. A permanent signal, as distinct from a hand signal or exhibition of a coloured flag or lamp. 2. A name for a miniature signal. 3. A device that secures facing points to prevent them moving when a train is passing over. 4. A diamond crossing with a set of points connecting the tracks which cross each other. 5. A "Distant" signal arm permanently fixed in the "Caution" position. 6. A fitting used in points connecting rods to transfer the movement of the rodding to another direction. 7. An acute angle crossing with movable blades instead of frogs. 8. Closing a signal box and switching out the block instruments. 9. An ornamental fitting to finish and protect the top of a signal post. 10. An extra signal arm, placed low on the post, which repeats the movements of the upper arm. Placed in localities where the main arm would not be plainly visible. Also, signal cabin indicators to show positions of signals not visible from the cabin.

SEPTEMBER 1951 WORD BUILDING CONTEST

1. Jackdawdle. 2. Petrelative. 3. Parrotifer. 4. Albatrosseous. 5. Puffinch. 6. Crowdy. 7. Woodpeckernel. 8. Eagleam. 9. Toucannery. 10. Sparrowlock. 11. Wrennet. 12. Swallowering.

NOVEMBER 1951 LOCOMOTIVE PARTS

1. Water scoop. 2. Hand rail. 3. Smoke-box door. 4. Steps. 5. Mechanical lubricator. 6. Whistle. 7. Smoke deflectors. 8. Pony truck. 9. Westinghouse brake pump. 10. Spring. 11. Reversing lever. 12. Number plate.



March 1952 Crossword Puzzle

Making Steel—(*Continued from page 343*)

drawn from the metal into the slag. Concurrently—and this applies also to the acid process—oxygen is injected into the liquid with special lances made to pierce the slag. This injection oxidises or burns the carbon into carbon dioxide, which bubbles its way through the slag, and also forms oxides of manganese and silicon, which pass into the slag. By such means all the elements concerned are reduced to very low proportions, and special alloys such as ferro-manganese and ferro-silicon are then added to give the desired composition.

My Lady the Frigate—(*Continued from page 346*)

turbine engines, and an armament of two 4-inch and ten anti-aircraft guns, to which various new inventions were added as they came out. Later classes varied slightly, running up to 1,600 tons, with an armament that varied with the special purposes for which they were designed. American escort destroyers were classed as frigates when they were serving in the British Fleet under the Lend-Lease scheme.

Since the war various escort destroyers, sloops and corvettes have been reclassed as frigates, a term which is now applied to all men-of-war that have the primary function of escorting, while a start has been made in the conversion of former destroyers into anti-submarine and anti-aircraft frigates, with their appearance entirely altered. The construction of a new type is now under way in both Canadian and British yards. In these new and converted ships all possible measures have been taken to mount the latest weapons and to minimise the effects of atomic attack.

Pleasure Fleets of the Thames—(*Cont. from p. 351*)

lies the bustling Port of London, whilst the trip towards the higher reaches takes the sightseer past many boat-building yards, where commercial as well as pleasure craft are built, including lifeboats of aluminium alloy and high-speed launches for overseas service.

Of special interest among the numerous types of craft are the "up-river" colliers known as "flatirons," which serve the power stations as far upstream as Wandsworth. Loaded with nearly 3,000 tons of coal, the flatiron collier lies low in the water and must travel upstream on the flood tide. But then there is the minimum clearance under the bridges, so the superstructure of the vessel must be squat, and collapsible masts are needed to enable the craft to get through.

Big Building—(*Continued from page 362*)

rise from the waste ground. More gradually, perhaps, order and tidiness emerge from what in the earlier stages appeared to be chaos. Near the end, the noise and confusion die away and only a few painters are left putting the finishing touches.

But even when everything is complete and the buildings are already occupied, some of the contractor's men must still remain behind for a while to make a final check up. Then the plant and equipment, the key men and their temporary homes take to the road again. A week or two later, however, they will all reappear in another part of the country, where the whole complicated process begins all over again.

Sails in the Sky—(*Continued from page 359*)

extended, flattened out in a long gentle approach which ended with a feather-light touchdown on the concrete runway at Maupertus Airport—a legacy of the *Luftwaffe*'s occupation of the Cherbourg peninsula.

Naturally, the dinghy was in perfect condition on arrival and its crew fresh enough to go out and win a race right away. There was no disputing the practicability of the idea of flying dinghies to the Continent. But Silver City had started more than a new service for sportsmen, for on the way across we calculated the cost of exporting boats by air to Continental buyers, compared with normal surface transport, and found that the air ferry won hands down. The reasons for this are that a Freighter can accommodate easily six small boats, without any expensive crates or packing, in the space normally occupied by two motor cars; and the air fares include full insurance cover, which can add up to one-third extra cost in the case of surface transport.

So, Silver City, who already do steady business flying British export motor cars and motor cycles to France, may soon find that Firefly No. 1000 merely set the pace for whole flotillas of other dinghies, all making their first sea journey at a height of several hundred feet above the waves.

New Meccano Models—(*Continued from page 369*)

2 of No. 24; 1 of No. 24a; 2 of No. 30; 190 of No. 37; 15 of No. 37a; 98 of No. 38; 1 of No. 45; 1 of No. 46; 3 of No. 48a; 1 of No. 48d; 4 of No. 51; 8 of No. 59; 4 of No. 62; 2 of No. 63; 1 of No. 73; 8 9f No. 90a; 1 of No. 95; 3 of No. 111; 12 of No. 111c; 2 of No. 111d; 1 of No. 116; 2 of No. 126a; 10 of No. 133; 1 of No. 136a; 1 of No. 166; 3 of No. 191; 2 of No. 197; 4 of No. 214; 10 of No. 215; 1 of No. 216.

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1947 August and September
1948 March–July, October and December
1949 March–December
1950 April, June–September, November and December
1951 February–October and December
1952 January, April and May

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Readers who require copies, should write immediately to the "Editor, Meccano Magazine, Binns Road, Liverpool 13," enclosing a Postal Order for the necessary amount.

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Fireside Fun

"Giles, I've decided to give you a rise."
"What for, sir?"
"Oh, because you've worked hard all the four years you've been with me."
"Then, sir, it looks to me as if you've been cheating me all these years."

* * * *

Visitor: "Never mind the rain, Mr. Brown. Remember, every cloud has a silver lining."
Farmer Brown: "It would be better if every cloud had a lining of fertiliser, and then the rain might make the crops grow as well as wet them."

* * * *

"I thought I told you not to jump across that stream."
"Well I didn't, mum."

* * * *

Irate Mistress: "Mary, yesterday you broke three tea-cups, the day before two plates, now the cream jug. What will it be tomorrow, I wonder?"
Mary: "Nothing, mum. It's my afternoon out."

* * * *

"Which travels the faster, a horse's forelegs or its hind ones?"
"What a silly question."
"Not at all. Its forelegs must be the faster, because its hindlegs never catch them."

* * * *

"Yes, this must be a healthy place. My father died at 150."
"What? At 150?"
"Yes. At 150, High Street."

* * * *

"I can speak in five languages."
"Go on, then. Say one."
"Kiwi, Nugget, Cherry Blossom."
"What language is that?"
"Polish."

* * * *

Teacher: "Your homework is dreadful. I can't imagine how one person could make so many mistakes."
Small boy: "Please, miss, it wasn't all my work. My father helped me."

* * * *

"Carry your bag, sir?"
"No."
"I'll carry it to the station for sixpence, sir."
"No, I tell you. I don't want it carrying."
"Then what are you carrying it for?"

* * * *

"Look out for the grubs when you're eating those windfalls."
"When I eat apples the grubs have to look out for themselves."

BRAIN TEASERS

HOW OLD IS AHMED'S AUNT?

Ahmed, an Indian boy, received four rupees from his aunt as a present on every anniversary of his birthday. As he was born long ago, before our world wars, Ahmed was a good boy, who always placed his present in his money box. When he died last year this was found to contain 48 rupees. What was the date of his birth? A.P.B.

* * * *

UNUSUAL NUMBER

There is a very curious number of six digits that gives results containing the same six digits in the same order when it is multiplied by 2, 3, 4, 5 or 6. The only difference in the numbers are that while the digits are in the same order, there is a different starting point for each one.

Can you find this number? V.B.

* * * *

BROKEN TIME

When a clock fell to the ground the face was broken into six pieces. By a curious coincidence—without which there would have been no puzzle!—the numbers on the six pieces made the same totals on addition.

Can you draw a clock face with lines across it to show how it was broken in this remarkable fall?

* * * *

NOTHING IN IT, SURELY

Smith was always boasting how clever he was at calculations. One day Brown, wishing to take a rise out of him, offered to sell him a three-cornered piece of land, with straight sides, at £1 a square yard. When Smith asked how much the land would cost altogether, Brown said that its sides were 83 yds., 144 yds., and 61 yds. respectively, and Smith could work out the answer to himself.

After struggling for some time Smith gave up and asked Brown to work out the total for him. Can you do what Smith could not do?

* * * *

"Be careful you don't drop my best tea set, Nora."
"Don't worry mum, if it falls it's too light to hurt my feet."

* * * *

SOLUTIONS TO LAST MONTH'S PUZZLES

Here is the answer to the first of our puzzles last month:

```
      7 3 5
        7 5
  -----------
    3 6 7 5
  5 1 4 5
  -----------
  5 5 1 2 5
  -----------
```

The coal merchant of our second puzzle was quite right. Those who know something of mechanics can easily work out for themselves that the sum of his two weighings would give the total weight of his lorry.

The new pond of our third puzzle has the four trees at the middle points of its sides, so that the sides of the new square have the same length as the diagonals of the old one.

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for Gauge 0 and Gauge 00

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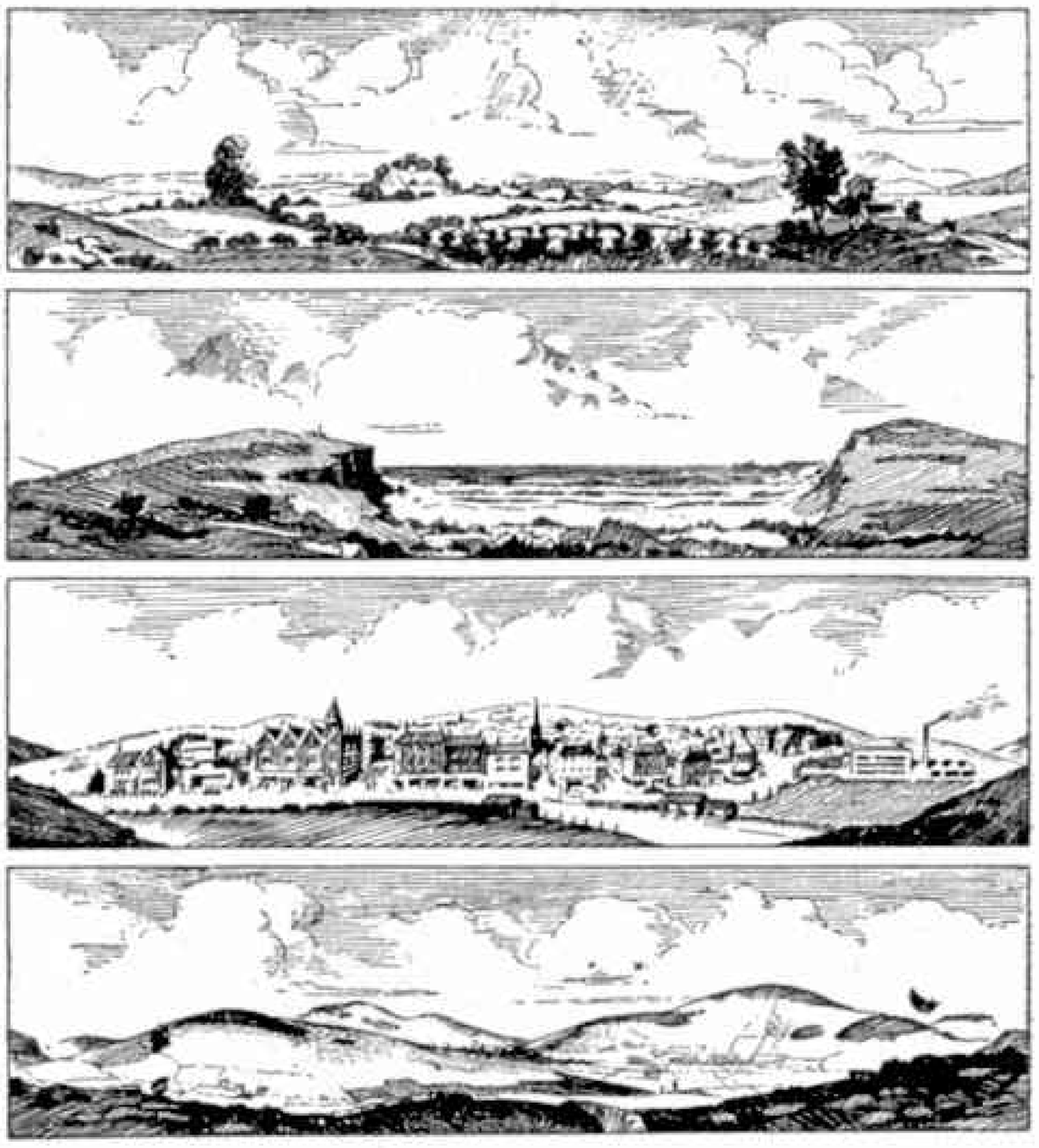

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1/4 in.	× 1/8 in.	3¾d.	3/8 in.	× 1/4 in.	7½d.
3/8 in.	× 1/8 in.	5½d.	1/2 in.	× 1/4 in.	7½d.
1/2 in.	× 1/8 in.	6d.	1 in.	× 1/4 in.	10½d.
1 in.	× 1/8 in.	7½d.	1½ in.	× 1/4 in.	1/2
1½ in.	× 1/8 in.	10½d.	2 in.	× 1/4 in.	1/9
2 in.	× 1/8 in.	1/2	3 in.	× 1/4 in.	2/4½
3 in.	× 1/8 in.	1/9	6 in.	× 1/4 in.	4/–
6 in.	× 1/8 in.	3/–	1/2 in.	× 1/2 in.	10½d.

Birch in 3 ft. lengths

1/16 in.	× 1/4 in.	2d.	1/16 in.	× 2 in.	9d.
1/16 in.	× 1/2 in.	3d.	1/16 in.	× 3 in.	1/–
1/16 in.	× 1 in.	5d.			

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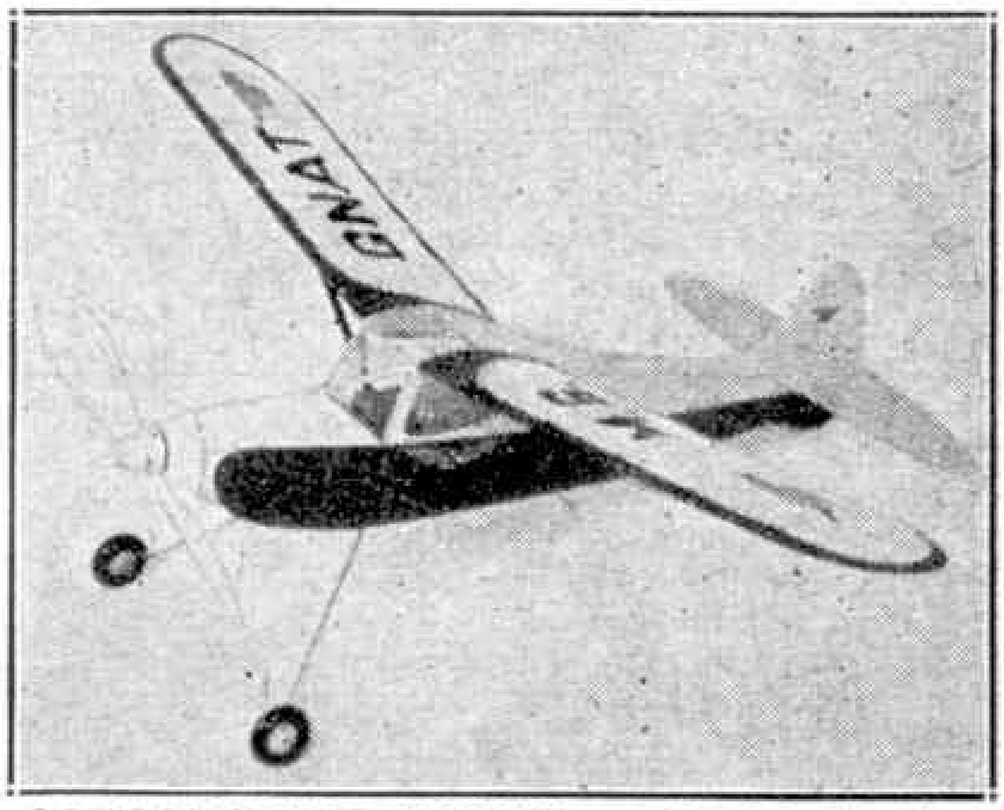

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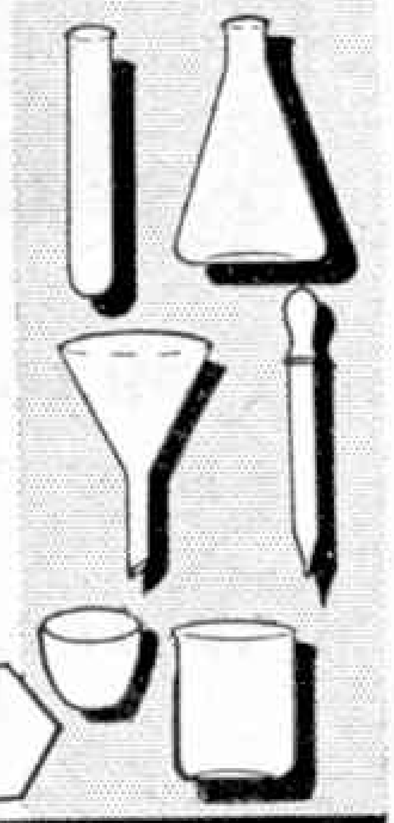

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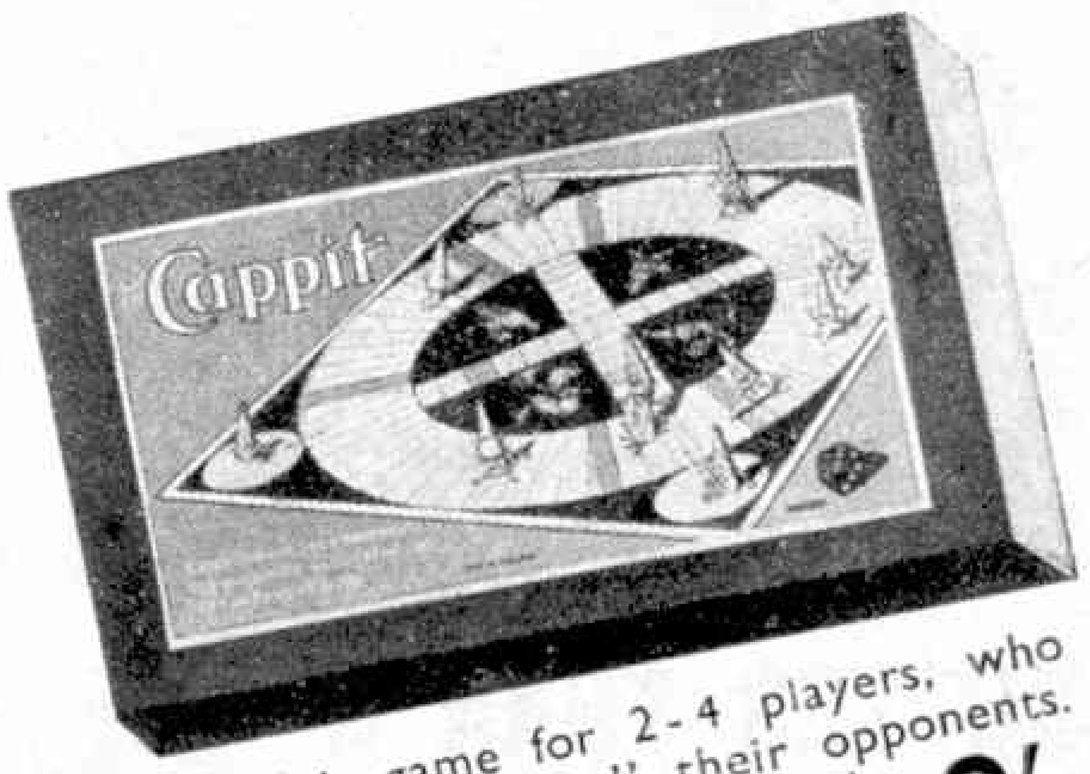

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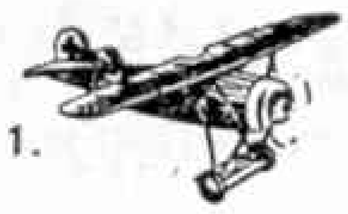
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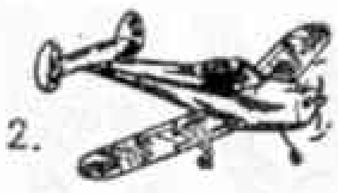
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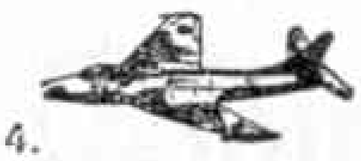
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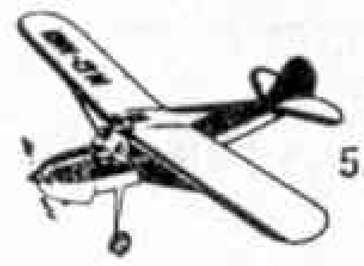
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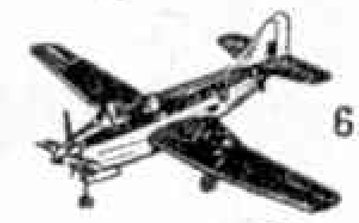
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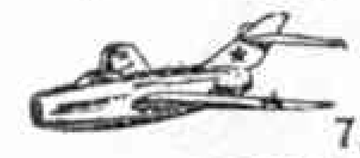
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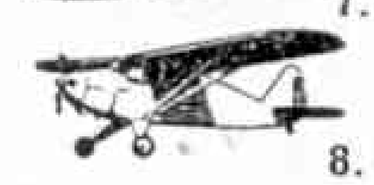
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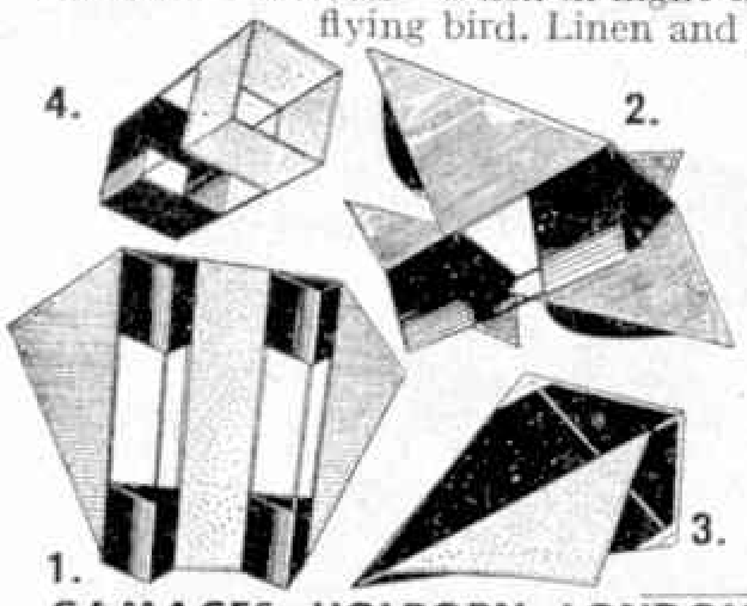
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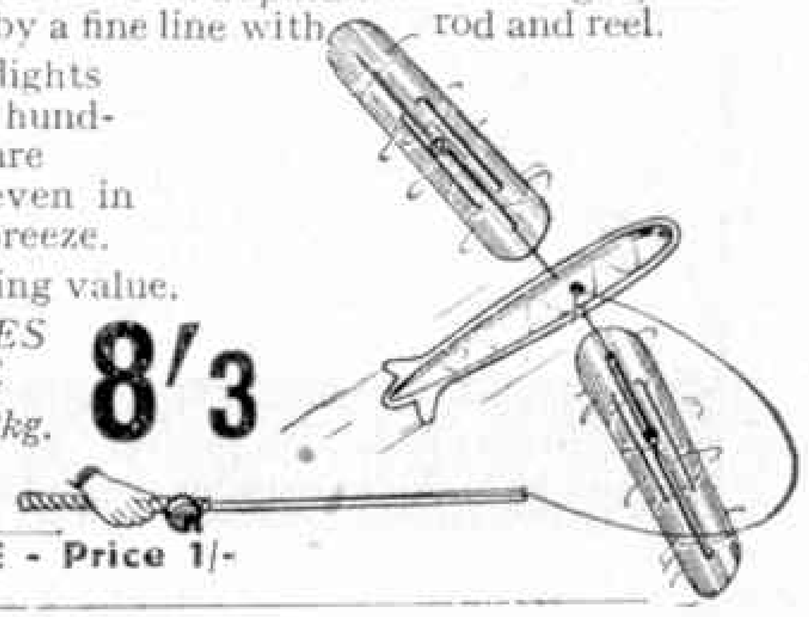

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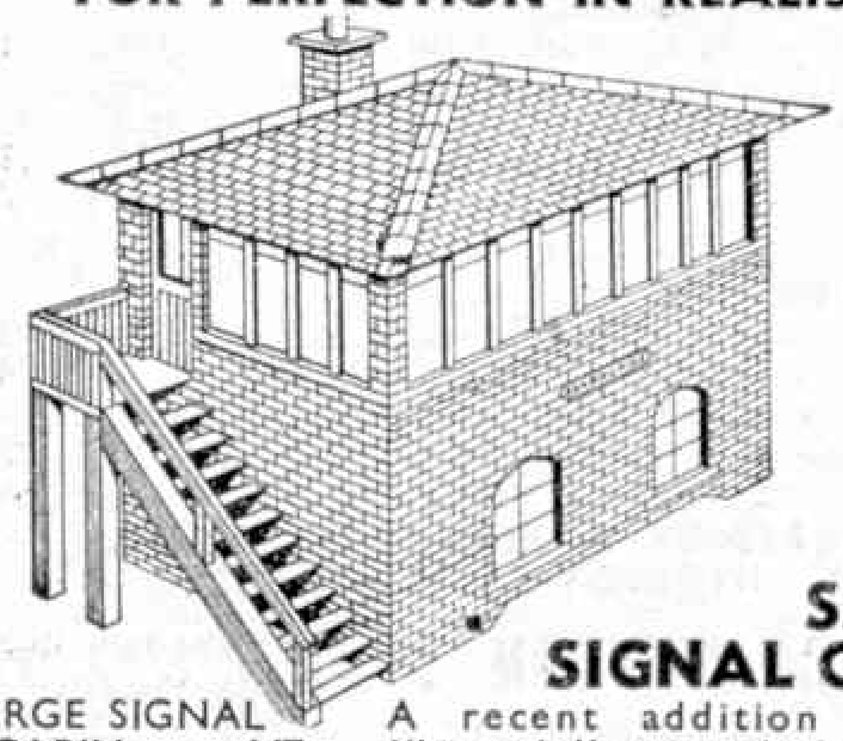

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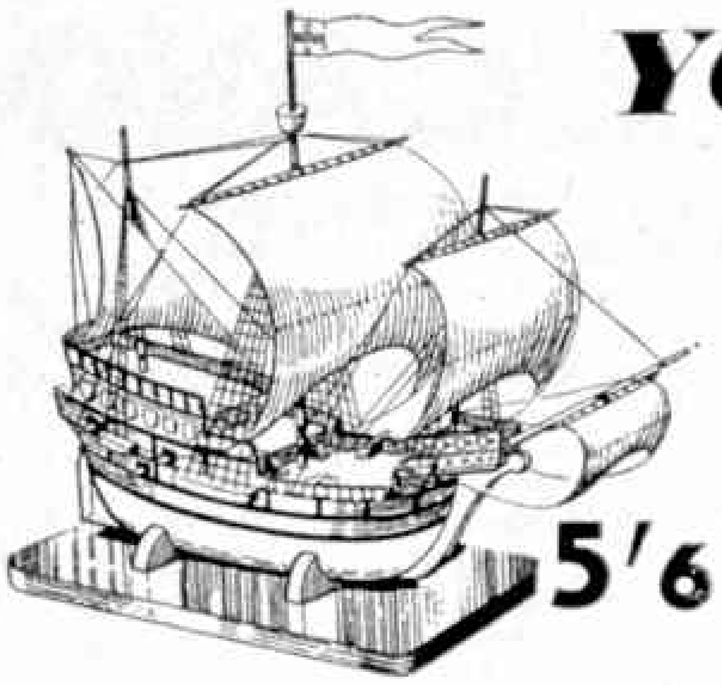

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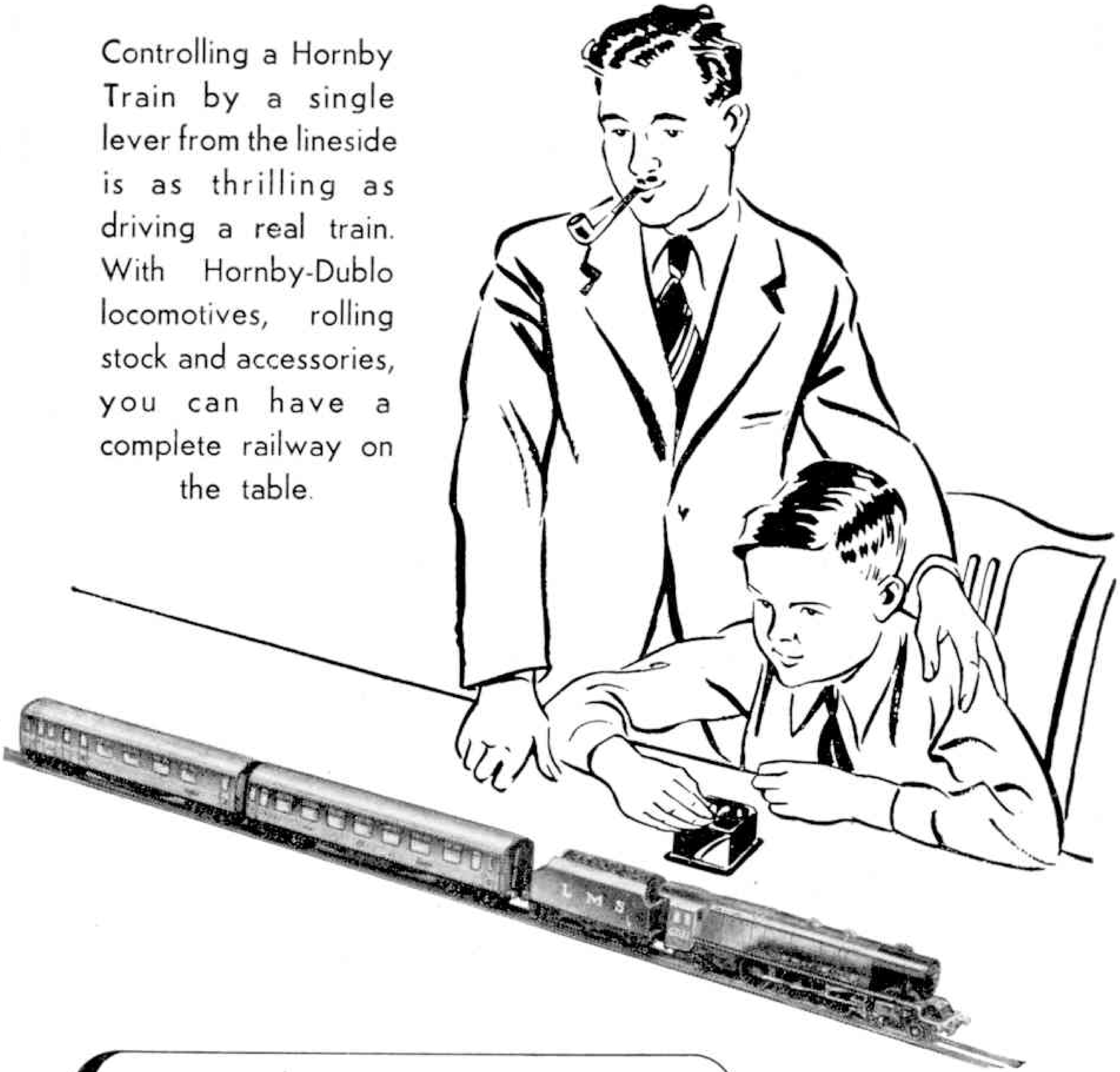

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